BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Academic Regulations & Syllabus
(w.e.f. 2020-2021)

4 Year B.Tech Program
of
Cyber Security

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

BAPATLA ENGINEERING COLLEGE :: BAPATLA
(AUTONOMOUS UNDER ACHARYA NAGARJUNA UNIVERSITY)
(SPONSORED BY BAPATLA EDUCATION SOCIETY)
BAPATLA - 522102 GUNTUR DISTRICT, A.P.
www.becbapatla.ac.in

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Vision of the Institute

To build centers of excellence, impart high quality education and instill high standards of ethics and professionalism through strategic efforts of our dedicated staff, which allows the college to effectively adapt to the ever-changing aspects of education.

To empower the faculty and students with the knowledge, skills and innovative thinking to facilitate discovery in numerous existing and yet to be discovered the fields of engineering, technology and inter-disciplinary endeavors.

Mission of the Institute

To impart the quality education at par with global standards to the students from all over India and in particular those from the local and rural areas.

To maintain high standards so as to make them technologically competent and ethically strong individuals who shall be able to improve the quality of life and economy of our country.

Vision of the Department

To produce Computer Science Engineers with Global Standards who can handle the challenges of the society and industry with their innovations and services.

Mission of the Department

- To impart high quality education with effective teaching and learning process.
- To provide an environment where the students can handle research problems confidently.
- To prepare the students with latest technologies with fidelity towards industry.
- To inculcate professional ethics and human values in handling the engineering challenges.

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Program Outcomes (PO'S)

	Program Outcomes	Engineering Graduates will be able to
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Create, select, and apply appropriate techniques, Resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and teamwork	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSO'S)

PSO1	Domain knowledge: Acquire knowledge of hardware functionality, design and development of software components required to process the information.
PSO2	Problem solving skills: Analyze data, Identify required data structures, design suitable algorithms, develop, operate and maintain software for real world problems.
PSO3	Paradigm shifts: Understand the progressive changes in computing; possess knowledge of context aware applicability of paradigms.

Program Educational Objectives (PEO'S)

PEO1	Have a strong foundation in the principles of Basic Sciences, Mathematics and Engineering to solve real world problems encountered in modern electrical engineering and pursue higher studies/placement/research.
PEO2	Have an integration of knowledge of various courses to design an innovative and cost effective product in the broader interests of the organization & society.
PEO3	Have an ability to lead and work in their profession with multidisciplinary approach, cooperative attitude, effective communication and interpersonal skills by participating in team oriented and open-ended activities.
PEO4	Have an ability to enhance in career development, adapt to changing professional and societal needs by engage in lifelong learning.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Academic Regulations

Regulations for Four Year Bachelor of Technology (B.Tech) Degree programme for the

Batches admitted from the academic year 2020-21

Preliminary Definitions and Nomenclature AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Acharya Nagarjuna University, Guntur).

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., one odd and one even.

Branch: Means specialization in a program like B.Tech degree program in Civil Engineering, B.Tech degree program in Computer Science and Engineering etc.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Backlog Course: A course is considered to be a backlog course, if the student has obtained a failure grade in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry etc., are considered to be foundational in nature.

Commission: Means University Grants Commission (UGC), New Delhi.

Choice Based Credit System: The credit-based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Certificate Course: It is a course that makes a student to have hands-on expertise and skills required for holistic development in a specific area/field.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Internal Examination: It is an examination conducted towards sessional assessment.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Learning Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student overall the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

Detention in a Course: Student who does not obtain minimum prescribed attendance in a course shall be detained in that particular course.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal examinations and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

Grade Point: It is a numerical weight allotted to each letter grade on a 10 - point scale.

Institute: Means Bapatla Engineering College, Bapatla, unless indicated otherwise by the context.

Massive Open Online Courses (MOOC): MOOCs inculcate the habit of self-learning. MOOCs would be additional choices in all the elective group courses.

Minor: Minors are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, UG degree program: Bachelor of Technology (B.Tech).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research-based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit-based course and is to be planned carefully by the student.

Registration: Process of enrolling into a set of courses in a semester of a program.

Regulations: The regulations, common to all B.Tech programs offered by Institute, are designated as "BEC Regulations – R20" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 to 18 weeks of academic work equivalent to normally 90 working days. Odd semester commences usually in July and even semester in December of every year.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioural.

University: Means Acharya Nagarjuna University, Guntur.

1. **Award of B.Tech. Degree:** A student will be declared eligible for the award of the B.Tech. degree if he/she fulfills the following academic regulations:

    i. Pursues a course of study for not less than four academic years and in not more than eight academic years. However, for the students availing Gap year facility, this period shall be extended by two years at the most and these two years would not be counted in the maximum time permitted for graduation. A lateral entry student pursues a course of study for not less than three academic years and in not more than six academic years.

    ii. Registers for 160 credits and secures all 160 credits. However, a lateral entry student registers for 121 credits and secures all the 121 credits from III semester to VIII semester of Regular B. Tech. program.

    iii. The student will be eligible to get Under graduate degree with honours or additional minor engineering if he/she completes an additional 20 credits.

    iv. A student will be permitted to register either for Honours degree or additional minor engineering but not both.

2. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech course and their admission stands cancelled. A lateral entry student should complete the course within six academic years from the year of their admission, failing which his/her admission in B.Tech course stands cancelled.

3. **Courses of study:** The following courses of study are offered at present as specializations for the B. Tech. course

S.No.	Title of the UG Programme	Abbreviation
1.	Civil Engineering	CE
2.	Computer Science & Engineering	CS
3.	Electrical & Electronics Engineering	EE

4.	Electronics & Communication Engineering	EC
5.	Electronics & Instrumentation Engineering	EI
6.	Information Technology	IT
7.	Mechanical Engineering	ME
8.	Cyber Security	CB
9.	Data Science	DS

4. Credits:

i. *Credit:* A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture) or two hours of practical work/field work per week.

ii. *Academic Year:* Two consecutive (one odd + one even) semesters constitute one academic year.

iii. *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses.

iv. Each course in a semester is assigned certain number of credits based on following

Description	Periods/Week	Credits
Theory	03	03
Tutorial	01	01
Practical	03	1.5
Internship (At the end of IV & VI evaluated in V & VII resp.)	-	1.5/3.0
Project Work	-	12

5. **Course Structure:** Every course of the B.Tech program will be placed in one of the 8 categories with suggested credits as listed below.

S.No.	Category	Category Description	Abbreviated Category	Credits
1	Humanities and Social sciences	Humanities and social science including Management courses	HS	10.5
2	Basic Sciences	Basic Science courses	BS	21
3	Engineering Sciences	Engineering Science Courses including workshop, drawing, basics of electrical / mechanical / computer etc.	ES	24

4	Professional Core	Professional core Courses	PC	51
5	Job oriented/Open Electives	Open Elective Courses- from other technical/ emerging and job oriented	JO/OE	12
6	Professional Electives	Professional Elective Courses relevant to chosen specialization/ branch	PE	18
7	Project Work	Project Work, Seminar, Internship in industry elsewhere	PW	16.5
8	Mandatory Courses	Environmental Studies, Induction training, Universal human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit)	MC	0
9	Skill Oriented Courses	Skill Oriented Courses relevant to domain, interdisciplinary, communication skill, industry	SC	10
Total Credits				160

6. Weightage for course evaluation

6.1. Course Pattern

- The entire course of study is for four academic years. Semester pattern shall be followed in all years.
- A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.
- When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

6.2. Evaluation Process

The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded.

The performance of a student in each course is assessed with alternate assessment methods, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, Internships carried out after IV Semester & VI Semester shall be evaluated for

100 marks each and the Internship along with Project Work carried out in VIII Semester shall be evaluated for 150 marks. For theory subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination. For practical subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination. For project work, the distribution shall be 50 marks for Internal Evaluation and 100 marks for the End-Examination / Viva-Voce. The distribution of marks between Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to be conducted at the end of the semester will be as follows:

Nature of the Course	**CIE**	**SEE**
Theory subjects	30	70
Drawing	30	70
Practical	30	70
Summer / Industrial Research Internship	--	100
Project work	50	100

6.3. Continuous Internal Evaluation (CIE) in Theory subjects:

6.3.1. In each Semester there shall be two Term examinations and some ***Alternate Assessment Tools (AAT)*** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The Alternate Assessment Tools with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course. It will be reviewed and approved by the Department Committee.

The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular year of study. The maximum weightage for Term Examinations, AATs and the calculation of marks for CIE in a theory course is given in the following table.

Particulars	**Term Exams (Max. 20 marks)**	**AAT (Max. 10 marks)**
Better Performed exam	75% of marks obtained	Continuous assessment by teacher as per the predetermined course delivery & assessment plan. (Minimum two & maximum four assessments). AAT marks shall be considered based on average of all tests conducted.
Other exam	25% of marks obtained	

A minimum of 15 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as qualified in that course and eligible to write the SEE of that course. If a student fails to obtain 15 marks in CIE, he can register for the course repetition as per the guidelines mentioned in 6.5.

6.3.2 Semester End Examination (SEE) in Theory and Design Course:

a) For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester for 70 marks, except where stated otherwise in the detailed Scheme of Instruction. Question paper setting shall be set by the teacher or teachers together in a multi section courses and to be verified as described in policy document.

b) A minimum of 25 (Approx. 35%) marks are to be secured exclusively in the Semester End Examination (SEE) of theory, design and/or drawing course. However a minimum 40 marks are to be secured in CIE & SEE together for the award of the grade and securing the credits in that course.

6.3.3 Continuous Internal Evaluation (CIE) in laboratory courses:

The evaluation for Laboratory course is based on CIE and SEE. The CIE for 30 marks comprises of 15 marks for day to day laboratory work, 5 marks for record submission and 10 marks for a laboratory examination at the end of the semester. In any semester, a minimum of 90% of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be taken up by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department concerned to be eligible to appear for the Final Examination in that laboratory course.

A minimum of 15 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as qualified in that lab course and eligible to write the SEE of that lab course. If a student fails to obtain 15 marks in CIE, he can register for the course repetition as per the guidelines mentioned in 6.5.

6.3.4 Semester End Examination (SEE) in laboratory courses:

a) For each laboratory course, the Semester End Examination (SEE) shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 70 marks which include 15 marks for write up, 35 marks for lab experiment/exercise, 15 marks for Viva-voce and 5 marks for general impression.

b) A minimum of 25 (Approx. 35%) marks are to be secured exclusively in the Semester End Examination (SEE) of laboratory course. However a minimum 40 marks are to be secured in CIE & SEE together for the award of the grade and securing the credits in that course.

6.3.5 Evaluation of Summer Internship and Industrial/Research Internship:

a) **Summer Internship at the end of IV semester and Industrial/Research Internship** at the end of VI carried out in industry are to be evaluated in V & VII semesters respectively based report and certificate provided by the industry. The report and certificate will be evaluated by the department committee for 100 marks. 50 marks shall be for the report and certificate and 50 marks based on seminars/presentation to the department committee by the student.

b) A minimum of 40 (40%) marks are to be secured exclusively to be declared as passed and securing the credits in the internships.

6.3.6 Evaluation of the Project

a) In case of the Project work, the evaluation shall be based on CIE and SEE. The CIE for 50 marks consists of a minimum of two Seminars / presentations for 20 marks and the Project Report submitted at the end of the semester which is evaluated for 30 marks.
b) A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in the Project Work and eligible to write the SEE in the Project Work.
c) SEE shall be evaluated in the form of a Viva- voce and the demonstration of the thesis work for 100 marks. Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner to be appointed by the Principal.
d) A minimum of 40 (40%) marks shall be obtained in SEE exclusively in order to be declared as passed in the Project and for the award of the grade.

NOTE : A student who is absent for any Test / Exam / Seminar / Presentation as a part of Continuous Internal Evaluation (CIE), for any reason whatsoever, shall be deemed to have scored zero marks in the respective component and no provision for make-up shall be provided.

6.4. There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the mandatory course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

6.5. Course Repetition (Repeater course)

The students not qualified to write SEE in a course may register for the repeater courses through course repetition and summer semester. The students have to apply to the Principal through the respective HOD by paying prescribed fees.

Course repetition: A student can take up a maximum of two theory courses in a semester immediately after the semester end examinations of that particular semester in accordance with the guidelines recommended by the Academic Council. The students who are not taking regular semester courses may additionally register for one more theory course.

Summer semester: Further the students can register maximum three (theory + lab courses together) courses in the summer semester. Summer semester courses shall be of both even & odd semesters. Summer semester shall be conducted immediately after completion of even semester end examinations.

The HODs concerned have to allot a teacher related to that course to conduct class work. The minimum number of periods to be conducted should not be less than 75% of the total

prescribed periods for that course. The classes will be conducted in the vacation period or in the weekends or in the afternoons as decided by the HOD concerned. Teacher has to evaluate the student for his performance in CIE as per the autonomous norms and the qualified students should appear for a semester end examination. The pass criteria in both CIE & SEE should be as per autonomous norms.

The documents for monitoring the candidates registered for course repetition are available with the Heads of the Departments and Exam Section.

6.6. There shall be five Professional Elective Courses from V Semester to VII and for each elective there shall be choices such that the student shall choose a course from the list of choice courses offered by the department for that particular elective.

6.7. There shall four be Open Electives / Job Oriented Courses common to all disciplines from V Semester to VII, where in the students shall choose the electives offered by various departments including his/her own department in such a manner that he/she has not studied the same course in any form during the Programme.

The students shall be permitted to pursue up to a maximum of two elective courses (either Professional Elective Courses in clause 6.6 or Open Electives/ Job Oriented Courses in clause 6.7) under MOOCs (Massive Open Online Courses) offered by NPTEL and other reputed organizations as notified by the Department during the semester. Each of the Courses must be of minimum 8/12 weeks in duration. The student has to acquire a certificate for the concerned course from the agency during the semester only in order to earn the credits for that course.

6.8. There shall be a mandatory **induction program** for three weeks before the commencement of first semester.

6.9. Minor in a discipline (Minor degree/programme) concept is introduced in the curriculum for all conventional B. Tech programmes in which it offers a major. The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme.

a. i) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

   ii) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

c. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BOS.

d. There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

e. The concerned BOS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

f. A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the end of 2^{nd} semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 8 SGPA upto 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

g. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

h. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BOS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

i. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

j. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BOS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

k. A committee should be formed at the level of College/Universities/department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BOS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

l. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

m. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

n. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

o. Minimum enrollment for a Minor course to be offered is 12

p. Students fulfilling the stipulated criterion can register for a Minor by paying a prescribed registration fee.

6.10. Honors degree in a discipline: Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

a. A student shall be permitted to register for Honors program at the beginning of 4^{th} semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2 semester without any backlogs. In case of the declaration of the 3^{rd} semester results after the commencement of the 4^{th} semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

b. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

c. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

d. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

e. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

f. The concerned BOS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

g. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the Annexure-2).

h. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the BOS/academic council.

i. The concerned BOS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

j. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

k. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

l. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

m. Minimum enrollment for the Honors to be offered is 12.

n. Students fulfilling the stipulated criterion can register for Honors by paying a prescribed registration fee.

6.11. National Service Scheme (NSS)/Yoga is compulsory for all the Undergraduate students. The student participation shall be for a minimum period of 45 hours during the first year. Grades will be awarded as Very Good, Good, and Satisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets Un-satisfactory grade, he/she has to repeat the above activity in the subsequent years along with the next year students.

6.12. Students shall undergo two summer internships each for a minimum of six weeks duration at the end of second and third years of the programme for 1.5 credits & 3 credits respectively. The organization in which the student wishes to carry out Internship need to be approved by Internal Department Committee comprising Head of Department and two senior faculty members. The student shall submit a detailed technical report along with internship certificate from the Internship organization in order to obtain the prescribed credits. The student shall submit the Internship Project Report along with Certificate of Internship. The evaluation of the first and second summer internships shall be conducted at the end of the V Semester & VII semester respectively.

There shall be internal evaluation for 100 marks and there shall not be external evaluation. The Internal Evaluation shall be made by the departmental committee (Head of the Department and two senior faculty of the department) on the basis of the project report submitted by the student.

Completion of the internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship in the subsequent summer provided that the student doesn't pursue two summer internships in the same summer.

Community Service Project focusing on specific local issues shall be an alternative to the six weeks of summer Internship, whenever there is any emergency and when students cannot pursue their summer internships. The Community Service Project shall be for 6 weeks in duration which includes preliminary survey for 1 week, community awareness programs for one week, community immersion program in consonance with Government agencies for 3 weeks and a community exit report (a detailed report) for one week. The community service project shall be evaluated for 100 marks by the internal departmental committee comprising Head of the Department and two senior faculty of the department. **However, the first priority shall be given to the internship.**

6.13. There shall also be a mandatory full internship in the final semester (VIII Semester) of the Programme along with the project work. The organization in which the student wishes to carry out the Internship need to be approved by Internal Department Committee comprising Head of the Department and two senior faculty. The faculty of the respective department monitors the student internship program along with project

work. At the end of the semester, the candidate shall submit a certificate of internship and a project report. The project report and presentation shall be internally evaluated for 50 marks by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. The Viva-Voce shall be conducted for 100 marks by a committee consisting of HOD, Project Supervisor and an External Examiner.

Completion of internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship along with project work for next six months.

6.14. There shall be five skill-oriented courses offered during III semester to VII semester. Out of the five skill courses, two shall be skill-oriented programs related to the domain and these two shall be completed in second year. Of the remaining three skill courses, one shall necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

The student can choose between a skill advanced course being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies which are duly approved by the Internal Department Committee. The credits assigned to the skill advanced course shall be awarded to the student upon producing the Course Completion Certificate from the agencies / professional bodies.

The Internal Department Committee comprising Head of Department and two senior faculty shall evaluate the grades / marks awarded for a course by external agencies and convert to the equivalent marks / grades.

7. Attendance Requirements:

- A student shall be eligible to appear for semester end examinations (SEE), if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on medical ground duly approved by the Principal.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- Further the student must obtain a minimum of 50% attendance in each subject failing which; the student shall not be permitted to write the SEE of that subject. Student has to register this subject through course repetition and satisfy the CIE qualification criteria of attendance and marks in the subsequent semesters.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

8. Minimum Academic Requirements: The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7

8.1. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project, if he/she secures not less than 15 marks in CIE and 25 marks in SEE. In case of, internships, project work viva – voce, he/she should secure 40% of the total marks. For mandatory courses minimum 15 marks in CIE are to be secured.

8.2. B.Tech students: A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to III Semester from the following examinations.

One regular and two supplementary examinations of I Semester.

One regular and one supplementary examination of II Semester.

One regular examination of III semester.

Lateral Entry students: A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to III Semester from the following examinations.

One regular examination of III semester.

8.3. B.Tech students: A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and four supplementary examinations of I Semester.

One regular and three supplementary examinations of II Semester.

One regular and two supplementary examinations of III Semester.

One regular and one supplementary examinations of IV Semester.

One regular examination of V Semester.

Lateral entry students: A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and two supplementary examinations of III Semester.

One regular and one supplementary examinations of IV Semester.

One regular examination of V Semester.

And if a student is detained for want of credits for particular academic year by sections 8.2 and 8.3 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V Semester or VII Semester as the case may be.

8.4. A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits. Marks obtained in all 160 credits shall be considered for the calculation of aggregate percentage of marks obtained. In case of lateral entry students, the number of credits is 121.

8.5. Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

Lateral entry students who fail to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

9. Course Pattern:

9.1. A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.

When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

9.2. **With–holding of Results:** If any case of indiscipline or malpractice is pending against candidate, the result of the candidate shall be with held and he/she will not be allowed/promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

9.3. **Grading:** After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade Points Assigned
≥ 90	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7

50-59	D (Average)	6
40-49	E (Below Average)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered. Same is the case with a student who obtains 'Ab' in end examination.

For **mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

10. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i}$$

where, C_i is the number of credits of the i^{th} subject and GP_i is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$\text{CGPA} = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j}$$

where "$SGPA_j$" is the SGPA of the j^{th} semester and TC_j is the total number of credits in that semester.

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. While computing the SGPA, the subjects in which the student is awarded Zero grade points will also be included.

v. *Grade Point:* It is a numerical weight allotted to each letter grade on a 10-point scale.

vi. *Letter Grade:* It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

11. Award of Class: After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he/she shall be placed in one of the following four classes.

Class Awarded	**CGPA Secured**
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.0 < 5.5$

12. Gap Year: Gap year concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether or not to permit the student(s) to avail the Gap Year.

13. Transitory Regulations: Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, and they will be in the academic regulations into which they get readmitted.

Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B.Tech from the date of commencement of class work, and they will be in the academic regulations into which the candidate is presently re-joining.

14. Minimum Instruction Days: The minimum instruction days including exams for each semester shall be 90 days.

15. Medium of Instruction: The Medium of Instruction is **English** for all courses, laboratories, internal and external examinations and project reports.

16. Rules of Discipline

I. Use of mobile phones with camera, in the campus is strictly prohibited.

II. Students shall behave and conduct themselves in a dignified and courteous manner in the campus/Hostels.

III. Students shall not bring outsiders to the institution or hostels.

IV. Students shall not steal, deface, damage or cause any loss to the institution property.

V. Students shall not collect money either by request or coercion from others within the campus or hostels.

VI. Students shall not resort to plagiarism of any nature/extent. Use of material, ideas, figures, code or data without appropriate acknowledgement or permission of the original source shall be treated as cases of plagiarism. Submission of material, verbatim or paraphrased, that is authored by another person or published earlier by oneself shall also be considered as cases of plagiarism.

VII. Use of vehicles by the students inside the campus is prohibited.

VIII. Any conduct which leads to lowering of the esteem of the organization is prohibited.

IX. Any material to be uploaded to social media sites need to be approved by Head of the Department concerned/Dean/Principal.

X. Any student exhibiting prohibited behaviour shall be suspended from the institute. The period of suspension and punishment shall be clearly communicated to the student. The student shall lose the attendance for the suspended period

XI. Dress Code

a. Boys: All the boy students should wear formal dresses. Wearing T-shirts and other informal dresses in the campus is strictly prohibited.
b. Girls : All the girls students shall wear saree / chudidhar with dupatta.

17. Punishments for Malpractice cases – Guidelines

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

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S.No.	Nature of Malpractice /Improper conduct	Punishment
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
2	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
3	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.
5	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.

S.No.	Nature of Malpractice / Improper conduct	Punishment
6	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
7	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeit of seat.
8	Refuses to obey the orders of the Chief Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.

S.No.	Nature of Malpractice / Improper conduct	Punishment
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in S.No7 to S.No 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
12	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of that semester/year. The student is

		rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
13	If any malpractice is detected which is not covered in the above S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

18. ADDITIONAL ACADEMIC REGULATIONS:

(ii) Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations, bribing for either marks or attendance will be treated as malpractice.

(iii)When a component of Continuous Internal Evaluation (CIE) or Semester End Examination (SEE) is cancelled as a penalty, he/she is awarded zero marks in that component.

19. AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations and / or Syllabi, Academic schedules, Examination schedules, Examination pattern, Moderation to students, Special opportunity to complete degree beyond stipulated time and any other matter pertained that meets to the needs of the students, society and industry without any notice and the decision is final.

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Course Structure Summary

S.No	Category	Credits	% of Credits
1	Humanities & Social Science including Management Courses	10.5	6.5
2	Basic Science Courses	18	11.5
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	22.5	14.0
4	Professional Core Courses	49.5	24.5
5	Professional Elective Courses	12	7.5
6	Job Oriented/Open Elective Courses	18	11.5
7	Project work, seminar, and internship in industry or elsewhere	16.5	16.5
8	Skill Oriented Courses	13	8.0
9	Mandatory Courses [Environmental Science, PEHV, Indian Constitution, Essence of Indian Traditional Knowledge etc]	-	-
Total		**160**	**100**

Semester Wise Credits Summary

Semester	Credits	With Honor Credits
Semester-I	16.5	16.5
Semester-II	22.5	22.5
Semester-III	21.5	21.5
Semester-IV	21.5	25.5
Semester-V	21.5	25.5
Semester-VI	21.5	25.5
Semester-VII	23	27
Semester-VIII	12	16
Total	**160**	**180**

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
First Year B.Tech (SEMESTER – I) structure as per APSCHE
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB101/MA01	BS	Linear algebra and differential equations	3	0	0	3	30	70	100	3
20CB102/PH03	BS	Semiconductor Physics	3	0	0	3	30	70	100	3
20CB103/EE01	ES	Basic Electronics & Electrical Engineering	3	0	0	3	30	70	100	3
20CB104/EL01	HS	Communicative English	3	0	0	3	30	70	100	3
20CBL101/PHL02	BS	Semiconductor Physics Lab	0	0	3	3	30	70	100	1.5
20CBL102/EEL01	ES	Basic Electronics & Electrical Engineering Lab	0	0	3	3	30	70	100	1.5
20CBL103/ELL01	HS	English Communication skills Lab	0	0	3	3	30	70	100	1.5
20CB105/CE01	MC	Environmental Studies	2	0	0	2	30	0	30	0
INDUCTION PROGRAM	First Three Weeks (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Familiarization to Dept./Branch & Innovations)									
TOTAL			**14**	0	**09**	**23**	**240**	**490**	**730**	**16.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

1 Hr. Lecture (L) per week - 1 credit
1 Hr. Tutorial (T) per week - 1 credit
1 Hr. Practical (P) per week - 0.5 credits
2 Hours Practical (Lab)/week - 1 credit

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
First Year B.Tech (SEMESTER – II)
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB201/MA02	BS	Numerical Methods & Advanced Calculus	3	0	0	3	30	70	100	3
20CB202/CY01	BS	Engineering Chemistry	3	0	0	3	30	70	100	3
20CB203/CS01	ES	Programming for Problem Solving	3	0	0	3	30	70	100	3
20CB204	ES	Digital Logic Design	3	0	0	3	30	70	100	3
20CB205	ES	Discrete Mathematics	3	0	0	3	30	70	100	3
20CBL201/MEL01	ES	Engineering Graphics	1	0	4	5	30	70	100	3
20CBL202/CYL01	BS	Chemistry Lab	0	0	3	3	30	70	100	1.5
20CBL203/CSL01	ES	Programming for Problem Solving Lab	0	0	3	3	30	70	100	1.5
20CBL204/MEL02	ES	Workshop Practice Lab	0	0	3	3	30	70	100	1.5
NCC/NSS			0	0	3	3				0
TOTAL			**16**	**0**	14	**30**	**270**	**630**	**900**	**22.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
Second Year B.Tech (SEMESTER – III)
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB301/MA03	BS	Probability & Statistics	3	0	0	3	30	70	100	3
20CB302	PC	Data Structures	3	0	0	3	30	70	100	3
20CB303	PC	Object Oriented Programming	3	0	0	3	30	70	100	3
20CB304	PC	Operating System	3	0	0	3	30	70	100	3
20CB305	PC	Computer Organization	3	0	0	3	30	70	100	3
20CBL303/SO01	SO	Python	2	0	3	5	30	70	100	3.5
20CBL301	PC	Data Structures Lab	0	0	3	3	30	70	100	1.5
20CBL302	PC	Object Oriented Programming Lab	0	0	3	3	30	70	100	1.5
20CB306	MC	Professional Ethics & Human Values	2	0	0	2	30	0	30	0
TOTAL			**19**	**0**	9	**28**	**270**	560	**830**	**21.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
Second Year B.Tech (SEMESTER – IV)
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB401/MA05	ES	Mathematical Foundations of Security	3	0	0	3	30	70	100	3
20CB402	PC	Web Technologies	3	0	0	3	30	70	100	3
20CB403	PC	Database Management System	3	0	0	3	30	70	100	3
20CB404	PC	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
20CB405/EL02	HS	Technical English	3	0	0	3	30	70	100	3
20CBL401/ SO02	SO	Kali Linux Virtual Lab Setup	2	0	3	5	30	70	100	3.5
20CBL402	PC	Web Technologies Lab	0	0	3	3	30	70	100	1.5
20CBL403	PC	RDBMS Lab	0	0	3	3	30	70	100	1.5
TOTAL			**17**	**0**	9	**26**	**240**	**560**	**800**	**21.5**
20CBM4_/ 20CBH4_	**Honors/Minor Course (Pool 1)**		**3**	**1**	0	**4**	**30**	**70**	**100**	**4**
Grand Total			**20**	**1**	9	**30**	**270**	**630**	**900**	**25.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
Third Year B.Tech (SEMESTER – V)
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB501	PC	Automata Theory & Formal Languages	3	0	0	3	30	70	100	3
20CB502	PC	Computer Networks	3	0	0	3	30	70	100	3
20CB503	PC	Software Engineering	3	0	0	3	30	70	100	3
20CB504/JO_ _	JO	Job Oriented Elective - 1	3	0	0	3	30	70	100	3
20CB505/PE_ _	PE	Professional Elective - 1	3	0	0	3	30	70	100	3
20CBL501/ SO03	SO	Soft Skills	1	0	2	3	30	70	100	2
20CBL502	PC	Software Engineering Lab	0	0	3	3	30	70	100	1.5
20CBL503	JO	Job Oriented Elective Lab -1	0	0	3	3	30	70	100	1.5
20CBL504 /INT01	INT	Summer Internship	0	0	0	0	0	0	0	1.5
20CB506/MC03	MC	Essence of Indian Traditional Knowledge	2	0	0	2	30	0	30	0
TOTAL			**18**	**0**	8	**26**	**270**	**560**	**830**	**21.5**
20CBM5_/ 20CBH5_	**Honors/Minor Course (Pool 2)**		**3**	**1**	0	**4**	**30**	**70**	**100**	**4**
Grand Total			**21**	**1**	8	**30**	**300**	**630**	**930**	**25.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
Third Year B.Tech (SEMESTER – VI)
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB601	PC	Compiler Design	3	0	0	3	30	70	100	3
20CB602	PC	Machine Learning	3	0	0	3	30	70	100	3
20CB603	PC	Cryptography	3	0	0	3	30	70	100	3
20CB604/PE_ _	PE	Professional Elective -2	3	0	0	3	30	70	100	3
20CB605/JO_ _	JO	Job Oriented Elective - 2	3	0	0	3	30	70	100	3
20CBL601/ SO04	SO	Advanced Skill Oriented - 1	1	0	2	3	30	70	100	2
20CBL602	PC	Machine Learning Lab	0	0	3	3	30	70	100	1.5
20CBL603	PC	Cryptography Lab	0	0	3	3	30	70	100	1.5
20CBL604	JO	Job Oriented Elective Lab - 2	0	0	3	3	30	70	100	1.5
20CB606/MC04	MC	Constitution of India	2	0	0	2	30	0	30	0
TOTAL			**18**	**0**	11	**29**	**300**	**630**	**930**	**21.5**
20CBM6_/ 20CBH6_	**Honors/Minor Course (Pool 3)**		**3**	**1**	0	**4**	**30**	**70**	**100**	**4**
Grand Total			**20**	**1**	9	**30**	**270**	**630**	**900**	**25.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
Fourth Year B.Tech (SEMESTER – VII)
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB701/PE_ _	PE	Professional Elective - 3	3	0	0	3	30	70	100	3
20CB702/PE_ _	PE	Professional Elective - 4	3	0	0	3	30	70	100	3
20CB703/JO_ _	JO	Job Oriented Elective - 3	3	0	0	3	30	70	100	3
20CB704/JO_ _	JO	Job Oriented Elective - 4	3	0	0	3	30	70	100	3
20CB705/ME05	HS	Industrial Management & Entrepreneurship Development	3	0	0	3	30	70	100	3
20CBL701/ SO05	SO	Advanced Skill Oriented - 2	1	0	2	3	30	70	100	2
20CBL702	JO	Job Oriented Elective – 3 Lab	0	0	3	3	30	70	100	1.5
20CBL703	JO	Job Oriented Elective – 4 Lab	0	0	3	3	30	70	100	1.5
20CBL704/ INT02	INT	Industrial/ Research Internship	0	0	0	0	0	0	0	3
TOTAL			**16**	**0**	8	**24**	**240**	**560**	**800**	**23**
20CBM7_/ 20CBH7_	**Honors/Minor Course (Pool 4)**		**3**	**1**	0	**4**	**30**	**70**	**100**	**4**
Grand Total			**20**	**1**	9	**30**	**270**	**630**	**900**	**27**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Cyber Security
Fourth Year B.Tech (SEMESTER – VII)
for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CB801/PW01	PROJ	Project Work	0	0	0	0	50	100	150	12
20CBM8_/ 20CBH8_	**Honors/Minor Courses (MOOCs - 1)**		**0**	**0**	0	**0**	**0**	**0**	**0**	**2**
20CBM8_/ 20CBH8_	**Honors/Minor Courses (MOOCs - 2)**		**0**	**0**	0	**0**	**0**	**0**	**0**	**2**
Grand Total			**0**	**0**	0	**0**	**50**	**100**	**150**	**16**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

List of Professional Electives:-

1. Introduction to Cyber Laws
2. Malware Analysis & Reverse Engineering
3. Security Assessment & Risk Analysis
4. Information Theory & Audit Monitoring
5. Cyber Crime Investigation and Digital Forensics
6. Protocols for Secure Electronic Commerce
7. Block chain Technologies
8. Wireless Networks
9. Distributed Systems.

List of Job Oriented Electives:-

1. Web & Data Security
2. Ethical Hacking & Social Engineering
3. Intrusion Detection and Prevention System
4. Secure Coding
5. Bio Metric Security
6. Digital Watermarking & Steganography
7. Mobile Application Security
8. Cloud Security
9. IoT security

List of Advanced Skill Oriented Elective:-

1. Network Simulation
2. Full Stack Development
3. DevOps
4. Robotic Process Automation

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List of Subjects offered under Honors in Cyber Security

Note: - Students have to acquire 20 credits for the award of Honors in Cyber Security.

i. 16 credits (04 courses@ 4 credits each) shall be earned through the following list of courses.

ii. 4 credits (02 courses@ 2 credits each) must be acquired through two MOOCs from the following list of courses with a minimum duration of 8/12weeks.

iii. Before choosing those courses, students must complete prerequisites.

1. Advanced Data Structures.
2. Advanced Computer Architecture
3. Graph Theory
4. Numerical Optimization.
5. Advanced Database Systems
6. Real Time Operating Systems.
7. Parallel Algorithms.
8. Embedded Systems.
9. Secure Computation
10. Firewall & VPN Security
11. Network Security & Cyber Laws.
12. Cyberspace Operations and Design.
13. Applied Cryptography.
14. Security Governance, Risk and compliance.
15. Perception & Computer Vision.
16. Secure Software Design & Enterprise Computing

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Linear Algebra and ODE I B.Tech –I Semester (Code: 20CB101/MA01)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	To learn about solving a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors.
CO2	Identify the type of a given differential equation and select and apply the appropriate Analytical technique for finding the solution of first order and higher order ordinary differential equations.
CO3	Create and analyze mathematical models using first and second order differential equations to solve application problems that arises in engineering.
CO4	To learn about solving linear Differential equations with constant coefficients with the given initial conditions using Laplace transform technique.

Course Outcomes: Students will be able to:

CLO-1	Apply elementary row operations to find the rank of a matrix, to solve a system of linear equations and to find the inverse of a matrix.
CLO-2	Find the Eigen values and Eigen vectors of the given square matrix and also compute the higher powers of the given matrix.
CLO-3	Solve separable, linear, exact differential equations with and without initial conditions.
CLO-4	Distinguish between linear and non-linear differential equation.
CLO-5	Write the piecewise continuous functions in terms of unit step functions and hence find its Laplace transforms.
CLO-6	Solve linear differential equation with constant coefficients and unit step input functions using Laplace transforms technique.

UNIT-1 (12 Hours)

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse;
Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values (without proofs); Cayley-Hamilton theorem (without proof).
[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT-2 (12 Hours)

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations.
Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy=0.
Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.
[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT-3 (12 Hours)

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working

procedure to solve the equation; Method of Variation of Parameters; **Applications of Linear Differential Equations:** Oscillatory Electrical Circuits. [Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5]	
UNIT-4	(12 Hours)
Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); **Application to differential equations**: Solution of ODE with constant coefficients using Laplace transforms. [Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]	
Text Books :	1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	1. ErwinKreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. 2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Semiconductor Physics I B. Tech. I-semester: CODE: 20CB102/PH03					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	This unit aim to build the foundation and inspires interest of freshmen into electrical and electronics and to focus on fundamental concepts and basic principles regarding electrical conduction.
CO2	This unit provides various properties of semiconductor materials and their importance in various device fabrications
CO3	This unit aim to educate the student on various opto-electronic devices and their applications.
CO4	This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nanostructures and their applications

Course Outcomes: Students will be able to:

CLO-1	Understand concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.
CLO-2	Know the concept of Fermi level and various semiconductor junctions.
CLO-3	Familiar with working principles of various opto-electronic devices and their applications.
CLO-4	Understand importance of nano-materials and their characteristic properties.

UNIT-1 (12 Hours)

ELECTRONIC MATERIALS:
Somerfield free electron theory, Fermi level and energy, density of states, Failure of free electron theory (Qualitative), Energy bands in solids, E-K diagrams, Direct and Indirect band gaps. Types of Electronic materials: Metals, Semi conductors and Insulators, Occupation Probability, effective mass, Concept of hole

UNIT-2 (12 Hours)

SEMICONDUCTORS:
Introduction to semiconductors, intrinsic and extrinsic semiconductors, carrier concentrations, Fermi level and temperature dependence, Continuity equation, Diffusion and drift, P-N junction (V-I characteristics), Metal – Semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for opto- electronic devices.

UNIT-3 (12 Hours)

OPTO-ELECTRONIC DEVICES AND DISPLAY DEVICES:
Photo voltaic effect, principle and working of LED, Applications of Photo diode, Solar cell, PIN & APD Diode, Liquid crystal display, Opto electric effect: Faraday Effect and Kerr effect.

UNIT-4 (12 Hours)

NANO-MATERIALS:
Introduction to nano technology, quantum confinement, surface to volume ratio, properties of nano materials, synthesis of nano-materials: CVD, sol-gel methods, laser ablation.
Carbon nano tubes: types, properties, applications. Characterization of nano materials: XRD, SEM, applications of nano materials.

Text Books :	1. A text book of engineering physics by Avadhanulu and KshirsagarS.Chand& Co. (2013) 2. Applied physics by Dr.*P.SrinivasaRao*. Dr.K.*Muralidhar* 3. Introduction to solid state state physics, Charles Kittel, 8th edition 4. Solid state physics, S.O. Pillai
References :	1. Text book on Nanoscience and Nanotechnology (2013): B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Springer Science & Business Media. 2. Basic Engineering Physics ,Dr.*P.SrinivasaRao*. Dr.K.*Muralidhar*. Himalaya Publications, 2016

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Basic Electrical and Electronics Engineering I B. Tech. – I Semester (Code: 20CB103/EE01)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO-1	To understand basic Laws in circuits, analysis of simple DC circuits, Theorems and its applications, fundamentals of AC circuits & its analysis and concepts of three phase balanced circuits
CO-2	To learn basic properties of magnetic materials and its applications.
CO-3	To understand working principle, construction, applications and performance of DC machines, AC machines.
CO-4	To learn basic concepts, working principal, characteristics and applications of semiconductor diode and transistor family.
CO-5	To gain knowledge about the static converters and regulators.
CO-6	To learn basic concepts of power transistors and operational amplifiers closer to practical applications.

Course Outcomes: Students will be able to:

CLO-1	Solve problems involving with DC and AC excitation sources in electrical circuits.
CLO-2	Compare properties of magnetic materials and its applications
CLO-3	Analyze construction, principle of operation, application and performance of DC machines and AC machines.
CLO-4	Explore characteristics and applications of semiconductor diode and transistion family.
CLO-5	Make the static converters and regulators
CLO-6	Analyze concepts of power transistors and operational amplifiers closer to practical applications

UNIT-1 (12 Hours)

Electrical Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems. Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-2 (12 Hours)

Electrical Machines

Magnetic materials, BH characteristics, Construction, working of DC machines, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections.Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor.Single-phase induction motor.Construction and working of synchronous generators.

UNIT-3	(12 Hours)
Semiconductor Diodes and applications Semiconductor materials, semiconductor diode, Resistance levels, Diode equivalent circuits, Zener diode, Light emitting diode, Load line analysis, half wave rectification, Full wave rectification, Bridge rectifier, Use of capacitor filter in rectifier, Zener diode voltage regulator, Clippers, Clampers **Bipolar Junction Transistors** Transistor construction and operation, Common base configuration, Transistor amplifying action, Common emitter configuration, Common collector configuration, Limits of operation. DC load line and bias point, Voltage divider bias of transistor.	
UNIT-4	(12 Hours)
Field Effect Transistors Construction and characteristics of JFET and MOSFET **Operational Amplifiers** Introduction, Differential and common mode operation, OP-AMP Basics, Practical OP-AMP circuits: Inverting amplifier, Non inverting amplifier, Unity follower, summing amplifier, Integrator and differentiator	
Text Books :	1. S.K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson Publications 2. Robert L. Boylestad& Louis Nashelsky, ' Electronic Devices and circuit theory', PHI Pvt.Limited, 11th edition 3. "Basics of Electrical and Electronics Engineering", Nagsarkar T K and Sukhija M S, Oxford press University Press.
References :	1. David A. Bell, 'Electronic Devices and Circuits', oxford publisher,5th edition 2. "Basic Electrical, Electronics and Computer Engineering", Muthusubramanian R, Salivahanan S and Muraleedharan K A, Tata McGraw Hill, Second Edition, (2006).

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Communicative English I B. Tech. – I Semester (Code: 20CB104/EL01)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	To comprehend the importance, barriers and strategies of listening skills in English.
CO2	To illustrate and impart practice Phonemic symbols, stress and intonation.
CO3	To practice oral skills and receive feedback on learners' performance.
CO4	To practice language in various contexts through pair work, role plays, group work and dialogue conversations

Course Outcomes: Students will be able to:

CLO-1	Understand basic grammatical units and their usage;
CLO-2	Learn to think, Write critically and coherently;
CLO-3	Recognize writings as a process rather than a product;
CLO-4	Upgrading comprehension skills of English Material of various types; and
CLO-5	Enhancing range of vocabulary to communicate in varied contexts.

UNIT-1	(12 Hours)

1.**1 Vocabulary Development:** Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes
1.2 **Essential Grammar:** Prepositions, Conjunctions, Articles
1.3 **Basic Writing Skills:** Punctuation in writing
1.4 **Writing Practices:** Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive)

UNIT-2	(12 Hours)

2.**1 Vocabulary Development:** Synonyms and Antonyms
2.2 **Essential Grammar:** Concord, Modal Verbs, Common Errors
2.3 **Basic Writing Skills**: Using Phrases and clauses
2.4 **Writing Practices**: Hint Development, Essay Writing

UNIT-3	(12 Hours)

3.1 **Vocabulary Development:** One word Substitutes
3.2 **Essential Grammar:** Tenses, Voices
3.**3 Basic Writing Skills:** Sentence structures (Simple, Complex, Compound)
3.4 **Writing Practices:** Note Making

UNIT-4	(12 Hours)

4.1 **Vocabulary Development**: Words often confused
4.2 **Essential Grammar**: Reported speech, Common Errors
4.3 **Basic Writing Skills**: Coherence in Writing: Jumbled Sentences
Writing Practices: Paraphrasing &Summarizing

Text Books :

1. Communication Skills, Sanjay Kumar &Pushpa Latha. Oxford University Press:2011.
2. Practical English Usage, Michael Swan. Oxford University Press:1995.
3. Remedial English Grammar, F.T.Wood. Macmillan:2007.

	4. Study Writing, Liz Hamplyons & Ben Heasley. Cambridge University Press:2006

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Semiconductor Physics Lab

I B.Tech– I Semester (Code: 20CBL101/PHL02)

Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	This unit aim to build the foundation and inspires interest of freshmen into electrical and electronics and to focus on fundamental concepts and basic principles regarding electrical conduction.
CO2	This unit provides various properties of semiconductor materials and their importance in various device fabrications
CO3	This unit aim to educate the student on various opto-electronic devices and their applications.
CO4	This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nano structures and their applications

Course Outcomes: Students will be able to:

CLO-1	Students demonstrate the ability to apply the knowledge of band theory of solids and concept of energy band gap and hole
CLO-2	Classify the different types of magnetic and dielectric materials and their applications
CLO-3	Understand importance of Nano materials, properties and their applications.
CLO-4	To familiarize the phenomenon of superconductivity and opto-electronic devices.
CLO-5	Students to understand the principle in the production and applications of ultrasonic
CLO-6	Students are able to estimate the crystal structures by x-ray diffraction technique.

LIST OF EXPERIMENTS

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. Study the variation of intensity of magnetic field along the axis of a circular coil using Stewart-Gee's apparatus.
3. Determination of thickness of thin wire using air wedge interference bands
4. Determination of radius of curvature of a Plano convex lens by forming Newton's rings..
5. Determination of wavelengths of mercury spectrum using grating normal incidence method.
6. Determination of dispersive power of a given material of prism using prism minimum deviation method.
7. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
8. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
9. Verify the laws of transverse vibration of stretched string using sonometer.
10. Determine the rigidity modulus of the given material of the wire using Torsional pendulum.
11. Draw the load characteristic curves of a solar cell.
12. Determination of Hall coefficient of a semiconductor.
13. Determination of voltage and frequency of an A.C. signal using C.R.O.
14. Determination of Forbidden energy gap of Si &Ge.
15. Determination of wavelength of laser source using Diode laser.

Any three experiments are virtual	
Text Books :	1. Engineering physics laboratory manual P.Srinivasarao & K.Muraldhar, Himalaya publications.

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Basic Electrical and Electronics Engineering Lab I B.Tech – I Semester (Code: 20CBL102/EEL01)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	To understand basic Laws in circuits, analysis of simple DC circuits, Theorems and its applications, fundamentals of AC circuits & its analysis and concepts of three phase balanced circuits
CO2	To learn basic properties of magnetic materials and its applications.
CO3	To understand working principle, construction, applications and performance of DC machines, AC machines.
CO4	To learn basic concepts, working principal, characteristics and applications of semiconductor diode and transistor family.
CO5	To gain knowledge about the static converters and regulators.
CO6	To learn basic concepts of power transistors and operational amplifiers closer to practical applications.

Course Outcomes: Students will be able to:

CLO-1	Solve Problems involving with DC and AC excitation sources in electrical circuits
CLO-2	Compare properties of magnetic materials and its applications
CLO-3	Analyze construction, principle of operation, application and performance of DC machines and AC machines
CLO-4	Explore characteristics and applications of semi conductor diode and transistor family
CLO-5	Make the static converts and regulators

LIST OF EXPERIMENTS

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Verification of Thevenin's theorem
4. Verification of Norton's theorem
5. Parameters of choke coil
6. Measurement of low and medium resistance using volt ampere method
7. OC & SC test of single phase transformer
8. Load test on single phase transformer
9. V-I characteristics of PN junction Diode
10. V-I characteristics of Zener Diode
11. Characteristics of CE Configuration
12. Transfer and Drain Characteristics of JFET
13. Calculation of Ripple factor using Half wave rectifier
14. Calculation of Ripple factor using Full wave rectifier
15. Non linear wave shaping – clippers/clampers

Note: Minimum 10 experiments should be carried.

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English Communication Skills Lab I B. Tech. –I Semester (Code: 20CBL103/ELL01)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	To comprehend the importance, barriers and strategies of listening skills in English.
CO2	To illustrate and impart practice Phonemic symbols, stress and intonation.
CO3	To practice oral skills and receive feedback on learners' performance.
CO4	To practice language in various contexts through pair work, role plays, group work and dialogue conversations

Course Outcomes: Students will be able to:

CLO-1	Learn to research and critically analyze issues to write critically and coherently;
CLO-2	Communicate pleasantly in kinds of Interpersonal Interactions;
CLO-3	Understand dynamics of Telephone Conversations through practice; and
CLO-4	Become familiar with the Pronunciation rules and application

1.1 Listening Skills; Importance – Purpose- Process- Types
1.2 Barriers to Listening
1.3 Strategies for Effective Listening

2.1 Phonetics; Introduction to Consonant, Vowel and Diphthong sounds
2.2 Stress
2.3 Rhythm
2.4 Intonation

3.1Formal and Informal Situations
3.2 Expressions used in different situations
3.3 Introducing Yourself & Others-Greeting & Parting-Congratulating-Giving Suggestions & Advices-Expressing Opinions-Inviting People-Requesting-Seeking Permission-Giving Information- Giving Directions- Sympathizing- Convincing People- Complaining & Apologizing-Thanking Others- Shopping- Travelling- Conversational Gambits

4.1 JAM Session
4.2 Debates
4.3 Extempore

Text Books :	1. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011 2. Better English Pronunciation, J.D. O' Connor. Cambridge University Press:1984 3. New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:2015 4. English Conversation Practice, Grant Taylor. McGraw Hill:2001
Software:	1. Buzzers for conversations, New Interchange series 2. English in Mind series, Telephoning in English 3. Speech Solutions, A Course in Listening and Speaking

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Environmental Studies I B. Tech. –I Semester (Code: 20CB106/MC01)					
Lectures	:	2 Hours/Week	Continuous Assessment	:	30
Final Exam	:		Final Exam Marks	:	

Pre-Requisite: None.

Course Objectives:

CO1	To develop an awareness, knowledge, and appreciation for the natural environment.
CO2	To understand different types of ecosystems exist in nature.
CO3	To know our biodiversity.
CO4	To understand different types of pollutants present in Environment.
CO5	Create awareness among the youth on environmental concerns important in the long-term interest of the society

Course Outcomes: Students will be able to:

CLO-1	Develop an appreciation for the local and natural history of the area.
CLO-2	Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people's movements focusing on environment.
CLO-3	Know how to manage the harmful pollutants.
CLO-4	Gain the knowledge of Environment.
CLO-5	Create awareness among the youth on environmental concerns important in the long-term interest of the society

UNIT-1	(8 Hours)

Introduction: Definition, Scope and Importance, Need for public awareness. Ecosystems: Definition, Structure and Functions of Ecosystems, types - Forest, Grassland, Desert, Aquatic (Marine, pond and estuaries).
Biodiversity: Definition and levels of Biodiversity; Values of Biodiversity - Consumptive, Productive, Social, Aesthetic, Ethical and Optional; Threats and Conservation of Biodiversity; Hot Spots of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation. Chipko movement case study

UNIT-2	(8 Hours)

Natural resources: Land: Land as a resource, Causes and effects of land degradation - Soil erosion, Desertification. **Forest**: Use of forests, Causes and effects of deforestation, Afforestation, Mining - benefits and problems. **Water**: Uses, floods and drought, Dams - benefits and problems.
Energy: Importance of energy, Environmental Impacts of Renewable and Non-renewable energy resources. Silent Valley Project and Narmada BachaoAndolan case studies
Sustainability: Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water harvesting and Watershed management.

UNIT-3	(8 Hours)

Pollution: Definition; Causes, effects and control of air, water and nuclear pollution; Chernobyl Nuclear Disaster case study; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermicomposting.
Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act.

UNIT-4	(8 Hours)

Environmental issues: Green House effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment. Environmental Standards (ISO 14000, etc.) **Case Studies:** Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare). **Field work:** Visit to a local area to document environmental assets – Pond/Forest/Grassland. Visit to a local polluted site- Urban and industry/ Rural and Agriculture.	
Text Books :	1. "Environmental Studies" by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi. 2. "Comprehensive environmental studies"- JP Sharma, Laxmi Publications. 3. Text Book of environmental Studies – ErachBharucha
References :	1. "Environmental studies", R.Rajagopalan, Oxford University Press. 2. "Introduction to Environmental Science", Anjaneyulu Y, B S Publications 3. "Environmental Science", 11th Edition – Thomson Series – By Jr. G. Tyler Miller.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Numerical Methods and Advanced Calculus I B. Tech. –II Semester (Code: 20CB201/MA02)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	To learn about some advanced numerical techniques e.g. solving a non-linear equation
CO2	linear system of equations, Interpolation and Approximation techniques
CO3	To learn about evaluation of double and triple integrals and their applications
CO4	To learn some basic properties of scalar and vector point functions and their applications to line, surface and volume integrals.

Course Outcomes: Students will be able to:

CLO-1	Solve non-linear equations in one variable and system of linear equations using iteration methods.
CLO-2	Choose appropriate interpolation formulae based on the given data.
CLO-3	Compute the value of a definite integral using numerical integration techniques.
CLO-4	Predict the numerical solution of the derivative at a point from the given initial value.
CLO-5	Problem using appropriate numerical method the Evaluate double and triple integrals using change of variables.
CLO-6	Transform line integrals to surface and surface to volume integrals and evaluate them.

UNIT-1 (12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections: 28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2 (12 Hours)

Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method.
[Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].

UNIT-3 (12 Hours)

Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integrals, Change of variables.
[Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].

UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem (without proof). [Sections: 8.4; 8.5.1; 8.5.3; 8.6; 8.11; 8.12; 8.13; 8.14; 8.16]	
Text Books :	1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	1. ErwinKreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. 2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Engineering Chemistry I B. Tech. – II Semester (Code: 20CB202/CY01)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.
CO2	To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.
CO3	With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics
CO4	With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

Course Outcomes: Students will be able to:

CLO-1	Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
CLO-2	Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion.
CLO-3	Have the capacity of applying energy sources efficiently and economically for various needs.
CLO-4	Design economically and new methods of organic synthesis and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.

UNIT-1 (12 Hours)

Introduction: water quality parameters
Characteristics: Alkalinity, Hardness - Estimation & simple numerical problems,
Boiler Troubles - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;
Internal conditioning- phosphate, calgon and carbonate methods.
External conditioning - Ion exchange process & Zeolite process WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration.
Disinfection methods: Chlorination, ozonization and UV treatment.
Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.

UNIT-2 (12 Hours)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.
Corrosion: Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion,
Corrosion control – Cathodic protection, and electro plating (Au) & electrodes Ni plating.

UNIT-3 (12 Hours)

Fuels: Classification of fuels; Calorific value of fuels (lower, higher)
Solid fuels: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking.
Liquid Fuels: Petroleum refining and fractions, composition and uses. Knocking and anti-knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods

of preparation and advantages **Gaseous fuels:** CNG and LPG, **Flue gas analysis –** Orsat apparatus.	
UNIT-4	(12 Hours)
Organic reactions and synthesis of a drug molecule Introduction to reactions involving substitution (SN^1, SN^2), addition (Markownikoff's and anti-Markwnikoff's rules) , elimination (E_1& E_2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol) **Polymers:** Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermoplasts and thermosetting plastics, Bskelite and PVC. Bio degradable polymers: types, examples-Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications.	
Text Books :	1. P.C. Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi 17th edition (2017). 2. SeshiChawla, "Engineering Chemistry" DhanpatRai Pub, Co LTD, New Delhi 13 th edition, 2013.
References :	1. Essential of Physical Chemistry by ArunBahl, B.S. Bahl, G.D.Tuli, by ArunBahl, B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012. 2. Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006). 3. Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Problem Solving using Programming I B.Tech – II Semester (Code: 20CB203/CS01)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: Basic Mathematics

Course Objectives:

CO-1	Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and arithmetics.
CO-2	Develop problem-solving skills to translate 'English' described problems into programs written using C language.
CO-3	Use Conditional Branching, Looping, and Functions.
CO-4	Apply pointers for parameter passing, referencing and differencing and linking data structures.
CO-5	Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

Course Outcomes: Students will be able to:

CLO-1	Choose the right data representation formats based on the requirements of the problem.
CLO-2	Analyse a given problem and develop an algorithm to solve the problem.
CLO-3	Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
CLO-4	Write the program on a computer, edit, compile, debug, correct, recompile and run it.
CLO-5	Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

UNIT-1 (12 Hours)

Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing I/O Operations. Decision Making and Branching.

Programming Exercises for Unit I: C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic and logical errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, Programs using Scientific and Engineering formulae. Finding the largest of the three given numbers. Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, finding given year is leap year or not, and conversion of lower case character to its upper case.

UNIT-2 (12 Hours)

Decision Making and Looping, Arrays, Character Arrays and Strings.

Programming Exercises for Unit II: To print the sum of the digits of a given number and to display the image of a given number. To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number. To print graphic patterns of symbols and numbers. To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not with and without using String Handling Functions. Transpose of a matrix and sorting of names using arrays.

UNIT-3 (12 Hours)

User-defined Functions, Structures and Unions, Pointers

Programming Exercises for Unit - III: Functions - Recursive functions to find factorial &

GCD (Greatest Common Divisor), string operations using pointers and pointer arithmetic. Swapping two variable values. Sorting a list of student records on register number using array of pointers	
UNIT-4	(12 Hours)
File Management in C, Dynamic Memory Allocation, Preprocessor **Programming Exercises for Unit - IV**: Operations on complex numbers, and to read an input file of marks and generate a result file, sorting a list of names using command line arguments. Copy the contents of one file to another file. Allocating memory to variables dynamically.	
Text Books :	1. Programming in ANSI C by E.Balaguruswamy, Fifth Edition.
References :	1. Kernighan BW and Dennis Ritchie M, "C programming language", 2nded, Prentice Hall. 2. Yashavant P. Kanetkar, "Let us C", BPB Publications. 3. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata Mcgraw-Hill. 4. Ashok N.Kamthane, "Programming in C", PEARSON 2nd Edition.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Digital Logic Design I B.Tech – II Semester(Code: 20CB204)					
Lectures	:	3 Hours /Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: Basic Computer Knowledge.

Course Objectives:

CO-1	Understand of the fundamental concepts and techniques used in digital electronics, and Number conversions.
CO-2	Understand basic arithmetic operations in different number systems and simplification of Boolean functions using Boolean algebra and K-Maps.
CO-3	Simplify the Boolean functions using Tabulation method, Concepts of combinational logic circuits.
CO-4	Understand the concepts of Flip-Flops, Analysis of sequential circuits
CO-5	Understand the concepts of Registers, Counters and classification of Memory units.

Course Outcomes: Students will be able to:

CLO-1	Understand digital number system, Boolean algebra, and circuit design and minimization.
CLO-2	Design the combinational circuits
CLO-3	Analyze and design synchronous sequential circuits
CLO-4	Design registers, counters and memories.

UNIT-1	(12 Hours)

DIGITAL SYSTEMS AND BINARY NUMBERS: Digital System, Binary Numbers, Number base Conversions, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic, Error Detection and Correction: 7 bit Hamming Code.

BOOLEAN ALGEBRA & LOGIC GATES: Introduction, Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and Standard Forms, Other Logic Operations, Digital logic gates.

GATE –LEVEL MINIMIZATION: Introduction, The map method, Four-variable K-Map, Product-of-Sums Simplification, Don't –Care Conditions, NAND and NOR implementation, Other Two level Implementations.

UNIT-2	(12 Hours)

MINIMIZATION: The Tabulation method, Determination of prime implicants, Selection of prime-implicants.

COMBINATIONAL LOGIC: Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adders - Subtractor, Decimal Adder, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNIT-3	(12 Hours)

SYNCHRONOUS SEQUENTIAL LOGIC: Introduction, Sequential Circuits, Storage Elements - Latches, Storage Elements -Flip Flops, Analysis of Clocked Sequential Circuits: State Equations, State Table, State Diagram, Flip Flop Input Equations, Analysis with D, JK and T Flip Flops; State reduction and Assignment, Design Procedure.

UNIT-4	(12 Hours)

REGISTERS and COUNTERS: Registers, Shift registers, Ripple Counters, Synchronous Counters.

MEMORY and PROGRAMMABLE LOGIC: Introduction, Random Access Memory: Read and Write Operations, Types of Memories; Read Only Memory, Programmable Logic Devices: PROM, PLA, PAL.	
Text Books :	1. M. Morris Mano, Michael D. Ciletti, "Digital Design", 5th Edition,PrenticeHall, 2013. 2. A. Anand Kumar, "fundamentals of digital circuits", 4th Edition, PHI.
References :	2. John F. Wakerly, "Digital Design: Principles and Practices", 4th Edition, Pearson, 2006. 3. Brian Holdsworth , Clive Woods, "Digital Logic Design", 4th Edition, Elsevier Publisher, 2002. 4. Donald E Givone, "digital principles and design", TMT.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Discrete Mathematics I B. Tech. – II Semester (Code:20CB205)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Understand operations on discrete structures such as sets, functions, and relations. Formulate short proofs using methods of proof of an implication. Verify the correctness of an argument using propositional logic and truth tables. Understand predicate logic and first order logic. Construct mathematical arguments using logical connectives and quantifiers.
CO2	Verify the correctness of an argument using rules of inference for quantified propositions. Apply algorithms and use definitions to solve problems to prove statements in elementary number theory. Understand counting and indirect counting techniques and combinatory in the context of discrete probability.
CO3	Understand sequences, generating functions, and recurrence relations. Understand and compute coefficients for generating functions. Understand and solve homogeneous recurrence relations.
CO4	Understand and solve Inhomogeneous recurrence relations. Understand the properties of binary relations, partial orderings and lattices. Construct graphs and adjacency matrices for binary relations.

Course Outcomes: Students will be able to:

CLO-1	Understand the basic principles of sets and operations on sets. Identify the type of given binary relation. Determine when a function is one to one and "onto". Use the rules of inference and verify the correctness of an argument.
CLO-2	Use the rules of inference for quantified propositions and verify the correctness of an argument. Prove that the given statement is correct by using mathematical induction. Solve counting problems by using indirect counting. Solve combinations and permutation problems for no repetition, constrained repetition and unlimited repetitions.
CLO-3	Build generating functions for sequences. Compute coefficients for generating functions. Solve homogeneous recurrence relations using various methods.
CLO-4	Solve Inhomogeneous recurrence relations. Construct digraph for the given binary relation. Construct hasse diagrams for posets. Find out the transitive closure of given relation.

UNIT-1	(12 Hours)

Foundations: Sets, Relations and Functions, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof.

UNIT-2	(12 Hours)

Rules of Inference for Quantified propositions, Mathematical Induction.
Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutation with Constrained repetitions..

UNIT-3	(12 Hours)

Recurrence relations: Generating functions of sequences, Calculating Coefficients of Generating Functions
Recurrence Relations: Solving recurrence relations by Substitution and generating functions, The methods of characteristic roots.

UNIT-4	(12 Hours)
Recurrence Relations: solutions of Inhomogeneous recurrence relations. **Relations:** Special properties of binary relations, Operations on relation. Ordering relations, Lattice, Paths and Closures, Directed Graphs and Adjacency Matrices.	
Text Books :	1.Toe L.Mott, Abraham Kandel &TheodoreP.Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", PHI 2nd edition.
References :	1. C.L. Liu, "Elements of Discrete Mathematics". 2. Rosen, "Discrete Mathematics".

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Engineering Graphics					
I B. Tech. – II Semester (Code: 20CBL201/MEL01)					
Lectures	:	5 Hours/Week (1T+4P)	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	clear picture about the importance of engineering graphics in the field of engineering
CO2	the drawing skills and impart students to follow Bureau of Indian Standards
CO3	To give an idea about Geometric constructions, Engineering curves, orthographic projections and pictorial projections
CO4	imagination skills about orientation of points, lines, surfaces and solids
CO5	basic drafting skills of Auto CAD

Course Outcomes: Students will be able to:

CLO-1	draw projections of points and projections of lines using Auto CAD
CLO-2	plot projections of surfaces like circle, square and rhombus
CLO-3	plot the Projections of solids like Prisms and pyramids
CLO-4	convert the of Orthographic views into isometric views of simple objects
CLO-5	generate the of pictorial views into orthographic views of simple castings

UNIT-1 (16 Hours)

INTRODUCTION: Introduction to Drawing instruments and their uses, geometrical construction procedures

INTRODUCTION TO AUTOCAD:

Basics of sheet selection, Draw tools, Modify tools, dimensioning

METHOD OF PROJECTIONS: Principles of projection - First angle and third angle projection of points. Projection of straight lines. Traces of lines.

UNIT-2 (16 Hours)

PROJECTIONS OF PLANES: Projections of plane figures: circle, square, rhombus, rectangle, triangle, pentagon and hexagon.

UNIT-3 (16 Hours)

PROJECTIONS OF SOLIDS: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones Inclined to one plane

UNIT-4 (16 Hours)

ISOMETRIC PROJECTIONS: Isometric Projection and conversion of Orthographic views into isometric views. (Treatment is limited to simple objects only).

UNIT-5 (16 Hours)

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).

Text Books :

1. Engineering Drawing with AutoCAD by Dhananjay M. Kulkarni (PHI publication)
2. Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand). (First angle projection)

References :	1. Engineering Drawing by Dhananjay A Jolhe, Tata McGraw hill publishers 2. Engineering Drawing by Prof.K.L.Narayana& Prof. R.K.Kannaiah.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Engineering Chemistry Lab I B.Tech –II Semester (Code: 20CBL202/CYL01)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.
CO2	To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.
CO3	With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics
CO4	With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

Course Outcomes: Students will be able to:

CLO-1	Develop innovative methods to produce soft water for industrial use and able to solve the industrial problems
CLO-2	the students will be familiar with applications of polymers in domestic and engineering areas & the most recent surface characterization techniques
CLO-3	Have the capacity of classifying fuels, their calorific value determination and applying energy sources efficiently and economically for various needs.
CLO-4	Explain features, classification, applications of newer class materials like smart materials, refrocteries, abbrasives, lubriants and composite materials etc.

LIST OF EXPERIMENTS

1. Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).

2. **Volumetric Analysis:**
   a. Estimation of Washing Soda.
   b. Estimation of Active Chlorine Content in Bleaching Powder
   c. Estimation of Mohr's salt by permanganometry.
   b. Estimation of given salt by using Ion-exchange resin using Dowex-50.

3. **Analysis of Water**:
   a. Determination of Alkalinity of Tap water.
   b. Determination of Total Hardness of ground water sample by EDTA method
   c. Determination of Salinity of water sample.

4. **Estimation of properties of oil:**
   a. Estimation of Acid Value
   b. Estimation of Saponification value.

5. **Preparations:**
   a. Preparation of Soap
   b. Preparation of Urea-formaldehyde resin
   c. Preparation of Phenyl benzoate.

Text Books :	1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons, Hyderabad, 2009. 2. Inorganic quantitative analysis, Vogel, 5th edition, Longman group Ltd. London, 1979.
References :	1. Text Book of engineering chemistry by R.n. Goyal and HarrmendraGoel. 2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara. 3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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Problem Solving using Programming Lab I B.Tech – II Semester (Code: 20CBL203/CSL01)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetictics.
CO2	Develop problem-solving skills to translate 'English' described problems into programs written using C language.
CO3	Use Conditional Branching, Looping, and Functions.
CO4	Apply pointers for parameter passing, referencing and differencing and linking data structures.
CO5	Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

Course Outcomes: Students will be able to:

CLO-1	Choose the right data representation formats based on the requirements of the problem
CLO-2	Analyze a given problem and deploy an algorithm to solve the problem
CLO-3	Use the comparison and limitations of the various programming construct and choose the right one for the task in hand
CLO-4	Write the program on a computer, edit, compile, debug, correct, recompile and run it

1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if-else statement).

Domestic Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 200	0.50 per unit	
201 – 400	100 plus	0.65 per unit
401 – 600	230 plus	0.80 per unit
601 and above	390 plus	1.00 per unit
Commercial Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 100	0.50 per unit	
101 – 200	50 plus	0.6 per unit
201 – 300	100 plus	0.70 per unit
301 and above	200 plus	1.00 per unit

2. Write a C program to evaluate the following (using loops):
   a. $1 + x^2/2! + x^4 / 4!+ \ldots$up to ten terms
   b. $x + x^3/3! + x^5/5!+ \ldots$ up to ten terms
3. Write a C program to check whether the given numbers
   a. Prime or not.
   b. Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
   a. Mean
   b. Mode

c. Median
d. Variance.

5. Write a C program to read a list of numbers and perform the following operations
   a. Print the list.
   b. Delete duplicates from the list.
   c. Reverse the list.
6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message "Element not found in the List".
7. Write a C program to read two matrices and compute their sum and product.
8. Write a C program to read list of student names and perform the following operations
   a. To print the list of names.
   b. To sort them in ascending order.
   c. To print the list after sorting.
9. Write a C program that consists of recursive functions to
   a. Find factorial of a given number
   b. Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.
10. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message "required copies not in stock" is displayed. Write a program for the above in structures with suitable functions.
11. Write a C program to read a data file of students' records with fields(Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40%) to a data file.
12. Write a C program to read a file as command line argument and count the given word frequency in a file

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Workshop Practice I B. Tech. –II Semester (Code: 20CBL204/MEL02)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 Gours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	To impart student knowledge on various hand tools for usage in engineering applications.
CO2	Be able to use analytical skills for the production of components.
CO3	Design and model different prototypes using carpentry, sheet metal and welding.
CO4	Electrical connections for daily applications.
CO5	To make student aware of safety rules in working environments.

Course Outcomes: Students will be able to:

CLO-1	Make half lap joint, Dovetail joint and Mortise &Tenon joint
CLO-2	Produce Lap joint, Tee joint and Butt joint using Gas welding
CLO-3	Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
CLO-4	Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring.

1. Carpentry
   a. Half Lap joint
   b. Dovetail joint
   c. Mortise &Tenon joint
1. Welding using electric arc welding process/gas welding
   a. Lap joint
   b. Tee joint
   c. Butt joint
2. Sheet metal operations with hand tools
   a. Trapezoidal tray
   b. Funnel
   c. T-joint
3. House wiring
   a. To control one lamp by a single switch
   b. To control two lamps by a single switch
   c. Stair-case wiring

Text Books :	1. P.Kannaiah and K.L.Narayana, Workshop Manual, SciTech Publishers, 2009. 2. K. Venkata Reddy, Workshop Practice Manual, BS Publications, 2008

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Probability & Statistics
II B. Tech. –III Semester (Code: 20CB301/MA03)

Lectures	:	3 Hours /Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	The Aptitude to learn about the concept of random variables and their properties
CO2	Evaluation of various Sampling Distributions
CO3	Statistical analysis for making decisions and choosing actions.
CO4	The Capability to infer the meaningful conclusions to the given data using statistical methods like Point Estimation

Course Outcomes: Students will be able to:

CLO-1	Understand the concept of random variables and probability mass functions, densities
CLO-2	Understand the mean and variance of a random variable.
CLO-3	Know various well-known distributions and how they are used in practice.
CLO-4	Understand joint, marginal, and conditional distributions
CLO-5	Interpret a confidence interval for a population mean when the population standard deviation is known and unknown.

UNIT-1 (12 Hours)

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Joint Distributions (Discrete),Joint Distributions (Continuous).Populations and Samples, Law of large numbers, Central limit theorem and its applications, The sampling distribution of the mean (σ unknown),The sampling distribution of the variance.
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.10, 6.1, 6.2, 6.3, 6.4 of Text Book [1])

UNIT-2 (12 Hours)

Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of Hypotheses, Hypothesis concerning one mean, Comparisons-Two independent Large samples, Comparisons-Two independent small samples, Paired sample t test.
(Sections 7.1,7.2, 7.4, 7.5, 7.6, 8.2, 8.3, 8.4 of Text Book [1])

UNIT-3 (12 Hours)

The Estimation of variances, Hypotheses concerning one variance, Hypotheses Concerning two variances, Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions, Procedure for Analysis of Variance (ANOVA) for comparing the means of k (>2) groups- one way classification (Completely randomized designs), Procedure for Analysis of Variance (ANOVA) for comparing the means of k (>2) groups- two way classification (Randomized block designs).
(Sections 9.1, 9.2, 9.3, 10.1, 10.2, 10.3, 12.2, 12.3 of Text Book [1])

UNIT-4 (12 Hours)

Multivariate Analysis: The concept of bivariate relationship, scatter diagram, Pearson‟s correlation and correlation matrix. Simple linear regression model and assumptions, Least Squares Estimation of the parameters of the model, Testing the significance of the model.

Regression versus Correlation, Multiple linear regression model with k explanatory variables and assumptions of the model. . Test for significance of the regression m o d e l and individual regression coefficients. Applications o f m u l t i p l e regression analysis. (1^{st} and 2^{nd} Chapters of Text Book [2])1	
Text Books :	1. Miller & Freund‟s "Probability and Statistics for Engineers",Richard A. Johnson,8^{th} Edition, PHI. 2. Introduction to Linear Regression Analysis, Douglas C. Montgomery, E.A. Peck and G.G. Vining, 3^{rd} edition, Wiley.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers „Probability & Statistics fo Engineers and Scientists‟, 6^{th} Edition, PHI. 2. Fundamentals of Mathematical Statistics, S. C. Gupta and V.K.Kapoor, 11^{th} Edition, Sultan Chand & Sons. 3. Murray R Spiegel , John J. Schiller, R. Alu Srinivas Probability & Satistics‟, Schaum's outline series. 4. K.V.S. Sarma, Statistics Made Simple – Do it yourself on PC‟, Prentice Hall India, Second Edition, 2015.

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Data Structures II B. Tech. – III Semester (Code: 20CB302)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: C-Programming

Course Objectives:

CO1	Analyse concepts of Abstract data type, data structure, performance measurement, time and Space complexities of algorithms.
CO2	To develop the implementation of array list and linked lists.
CO3	To learn the implementation linear data structures such as stacks, queues
CO4	To learn the implementation non-linear data structures such as tree, hashing.

Course Outcomes: Students will be able to:

CLO-1	Understand and program basic data structures like arrays and linked lists with their applications. Understand concepts of Algorithm complexities.
CLO-2	Understand and Program data structures like stacks and queues with their applications. Understand and implement sorting algorithms.
CLO-3	Understand and program on trees, binary trees, binary search trees, AVL trees, expression trees and their traversal methods, including algorithm complexities.
CLO-4	Understand and program on priority queues, hashing and their mechanisms.

UNIT-1 (12 Hours)

Algorithm Analysis: Mathematical Background, Model, what to Analyze, Running Time Calculations.
Lists: Abstract Data Types, The List ADT, Singly Linked List ADT, Doubly Linked List ADT, Circular Linked List ADT, Polynomial ADT: addition, multiplication operations.

UNIT-2 (12 Hours)

Stacks and Queues: The Stack ADT and its applications such as Infix to Postfix expression conversions, Evaluation of Postfix expressions. The Queue ADT, Queue Application-Radix sort.
Basic Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Shell sort

UNIT-3 (12 Hours)

Trees: Preliminaries, Binary Trees, Expression trees, The Search Tree ADT, Binary Search Trees, Splay Trees, Implementations, AVL Trees-Single Rotations, Double rotations, Implementations.

UNIT-4 (12 Hours)

Hashing: General Idea, Hash Function, Separate Chaining, Open Addressing.
Priority Queues (Heaps): Model, Simple implementations, Binary Heap, Heap Sort.

Text Books :	1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education.
References :	1. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, "Data Structures Using C", Pearson Education Asia, 2004. 2. Richard F.Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 1998.

	3. Aho, J.E. Hopcroft and J.D. Ullman, "Data Structures andAlgorithms", Pearson Education Asia, 1983.

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Object Oriented Programming II B. Tech. –III Semester (Code: 20CB303)					
Lectures	:	3 hours /Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Understand advantages of OO programming over procedural oriented programming, learn the basics of variables, operators, control statements, arrays, classes and objects.
CO2	Understand, write and implement the following concepts: Inheritance, Interfaces, Packages, Strings and Collections.
CO3	Understand and write programs on Exception Handling, I/O, and Multithreading.
CO4	Understand and implement applications using Applets, AWT, Swings and Events.

Course Outcomes: Students will be able to:

CLO-1	Understand basic Java language syntax and semantics to write Java programs, use concepts such as variables, conditional and iterative execution methods etc. And use the Java SDK environment to create, debug and run Java programs
CLO-2	Identify classes, objects, members of a class and relationships among them needed for a specific problem and Write Java application programs using OOP principles and proper program structuring
CLO-3	Demonstrate the concepts of polymorphism, inheritance, packages and interfaces.
CLO-4	Write Java programs to implement error handling techniques using exception handling

UNIT-1	(12 Hours)

The History and Evolution of Java
An Overview of Java
Data Types, Variables and Arrays
Operators
Control Statements
Introducing Classes
A Closer Look at Methods and Classes

UNIT-2	(12 Hours)

Inheritance
Packages and Interfaces
Strings: String Constructors, Any 10 String class methods, StringBuffer class, Any 10 StringBuffer class methods, Introducing StringBuilder class.
Type Wrappers: Auto boxing/unboxing.
Collections: Collections Overview, Names of Collection Interfaces,
Collection Classes: LinkedList<String>, Array List<String>

UNIT-3	(12 Hours)

Exception Handling
Multithreaded Programming
I/O: I/O Basics, Reading Console Input, Writing Console Output, The Print Writer class, Reading and Writing Files, Automatically Closing a File.

UNIT-4	(12 Hours)

The Applet Class: Applet Architecture, An Applet Skeleton, Applet program to draw

shapes, setting Color, Font using Graphics class **Event Handling:** **Introducing the AWT:** Window Fundamentals, **AWT components:** Label, Text Field, Text Area, Checkbox, Checkbox Group, Button, **Layout Managers:** Flow Layout, Grid Layout, and Border Layout. **GUI Programming with Swing:** The Origins of Swing, Advantages of Swing over AWT, The MVC Connection, **Swing Components:** JLabel, JText Field, JText Area, JCheck box, JButton, JTabbed Pane, JTable, JTree, JCombo Box	
Text Books :	1. "Java The Complete Reference", 9th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2014.
References :	1. "Big Java ", 4th Edition, Cay Horstman, John Wiley & Sons, 2009. 2. "Java How to Program (Early Objects)", H. M. Dietel and P. J. Dietel, 11th edition Pearson Education, 2018.

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Operating Systems II B. Tech. –III Semester (Code: 20CB304)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Understand different structures, services of the operating system and the use of scheduling and operations on process.
CO2	Understand the use of scheduling, operations on process, the process scheduling algorithms and synchronization concepts.
CO3	Understand the concepts of deadlock, memory and virtual memory management techniques.
CO4	Understand the concepts of File System, Input/output systems and system protection of various operating systems.

Course Outcomes: Students will be able to:

CLO-1	Analyze the structure of OS and basic architectural components involved in OS design
CLO-2	Student is able to point the problems related to process management and synchronization as well as is able to apply learned methods to solve basic problems.
CLO-3	Student is capable of explaining the cause and effect related to deadlocks and understand the concepts of memory management including virtual memory
CLO-4	Understand the issues related to file system management and familiar with I/O and file protection mechanisms

UNIT-1 (13 Periods)

Introduction: What OSs Do, Computer System Operation, Storage structure, OS Structure, OS Operations.

Operating-System Structures: OS Services, User and operating system Interface, System Calls, Types of System Calls, System Programs, OS Design and Implementation, OS Structure.

Processes: Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication.

Threads: Overview, Multicore Programming, Multithreading Models.

[Sections:1.1, 1.2.1, 1.2.2,1.4,1.5, 1.5.1,2.1, 2.2,2.3,2.4, 2.5, 2.6, 2.7,2.7.1,2.7.2,2.7.3,2.7.43.1, 3.2,3.3,3.4, 4.1,4.2,4.3]

UNIT-2 (12 Hours)

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

Process Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of Synchronization, Monitors.

[Sections : 5.1,5.2,,5.3,5.4,5.5,5.6,5.7,5.8, 6.1,6.2,6.3]

UNIT-3 (12 Hours)

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection and Recovery.

Main Memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual-Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Other Considerations.

[Sections; 7.1,7.2,7.3,7.4,7.5,7.6,7.7,8.1,8.2,8.3,8.4,8.5,8.6,9.1, 9.2,9.3,9.4,9.5,9.6,9.9]	
UNIT-4	(12 Hours)
File System Interface: File concept, Access Methods, Directory and Disk Structure, **File System Implementation**: File System Structures, Directory Implementation, Allocation Methods **Protection**: Goals of Protection, Principles of Protection, Domain of Protection- Domain Structure, Access Matrix, Implementation of Access Matrix. **Mass Storage Structure**: Over View, Disk Structure, Disk Scheduling, Disk Management, RAID levels [Sections:10.1,10.2,10.4,10.5,10.7,11.1,11.2,11.3,11.5,12.1,12.3,12.4,14.1,14.2,14.3,14.3.1, 14.4,14.5]	
Text Books :	1. Silberschatz & Galvin, "Operating System Concepts", 9th edition, John Wiley & Sons (Asia) Pvt.Ltd.
References :	1. William Stallings, "Operating Systems – Internals and Design Principles", 5/e, Pearson 2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Co., 1998 edition 3. Andrew S.Tanenbaum, "Modern Operating Systems", 2nd edition, PHI

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Computer Organization					
II B. Tech. –III Semester (Code: 20CB305)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: Digital logic design

Course Objectives: Students will be able to:

CO-1	Represent the data, micro-operations, and hardware implementation of arithmetic, logic and shift unit.
CO-2	Know about the instruction codes and generation of control signals using hardwired and micro-programmed approaches.
CO-3	Learn about the different types of instructions and arithmetic operations.
CO-4	Understand the organization of the memory and I/O units.

Course Outcomes:

CLO-1	Representation of the data, micro-operations, and implementation of hardware for arithmetic, logic and shift unit.
CLO-2	Understand the flow of execution of instruction by the CPU and design of the control unit using hardwired and micro-programmed approaches.
CLO-3	Study the instruction set of basic computer and draw the flowcharts of the arithmetic operations.
CLO-4	Understand the memory and I/O organizations.

UNIT-1 (12 Hours)

DATA REPRESENTATION: Data Types, Complements, Fixed-Point Representation, Floating-Point Representation.
REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro Operations, Logic micro operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

UNIT-2 (12 Hours)

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic.
MICRO PROGRAMMED CONTROL: Control Memory, Address Sequencing, Microprogram Example, Design of Control Unit.

UNIT-3 (12 Hours)

CENTRAL PROCESSING UNIT: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer vs Complex Instruction Set Computers.
COMPUTER ARITHMETIC: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT-4 (12 Hours)

THE MEMORY SYSTEM: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.
INPUT-OUTPUT ORGANIZATION: Peripheral Devices, Input-Output Interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor.

Text Books :	1. Computer SystemArchitecture, M.MorrisMano, 3rdEdition, Pearson/PHI.

References :	1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill. 2. Computer Organization and Architecture, William Stallings, Sixth Edition, Pearson/PHI.

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Python Programming II B.Tech–III Semester (Code: 20CBL301/SO01)					
Practicals	:	5 Hours/Week (2T+3P)	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Understand and write code using the basics of Python, Statements, Expressions, Conditional Executions, and Functions.
CO2	Write code for Iteration, Strings, File I/O.
CO3	Write code in creating, usage of Lists, Dictionaries, and Tuples.
CO4	Understand the concepts of Object Orientation, Databases and write code implementing them.

Course Outcomes: Students will be able to:

CLO-1	Understanding of scripting and the contributions of python language.
CLO-2	Understanding of Python especially the object-oriented concepts, using databases.
CLO-3	Able to design and implement machine learning solutions to classification, regression.
CLO-4	Able to design and implement machine learning solutions to clustering problems and features of various data.

UNIT-1 (32 Hours)

Introduction: Overview, History of Python, Python Features, Environment Setup. Variables, expressions, and statements: values and types, variables, names and keywords, statements, operators and operands, expressions, order of operations, modulus operator, string operations, asking the user for input, comments, choosing mnemonic variable names.

Conditional execution: Boolean expressions, logical operators, conditional execution, Alternative execution, chained conditionals, nested conditionals, catching exceptions using try and except, short-circuit evaluation of logical expressions.

Functions: function calls, built-in functions, type conversion functions, random numbers, math functions, adding new functions, definitions and uses, flow of execution, parameters and arguments, fruitful functions and void functions.

Iteration: updating variables, the while statement, infinite loops and break, finishing iterations with continue, definite loops using for, loop patterns.

Strings: string is a sequence, getting the length of a string using len, traversal through a string with a loop, string slices, strings are immutable, looping and counting, the in operator, string comparison, string methods, parsing strings, format operator.

Files I/O:persistence, opening files, text files and lines, reading files, searching through a file, letting the user choose the file name, using try except and open, writing files.

Lists: a list is a sequence, lists are mutable, traversing, operations, slices, methods, deleting elements, functions, strings, parsing lines, objects and values, aliasing, arguments.

Dictionaries: dictionary as a set of counters, dictionaries and files, looping and dictionaries, advanced text parsing.

Tuples: tuples are immutable, comparing tuples, tuple assignment, dictionaries and tuples, multiple assignment with dictionaries, the most common words, using tuples as keys in dictionaries, sequences.

Object-Oriented Programming: Managing Larger Programs, Using Objects, starting with Programs, Subdividing a Problem–Encapsulation, First Python Object, Classes as Types, Object Lifecycle, Many Instances, Inheritance.

Using Databases and SQL: Database concepts, Database Browser for SQLite, creating a database table, Structured Query Language summary, Basic data modeling, Programming with

multiple tables, three kinds of keys, Using JOIN to retrieve data.

LIST OF EXPERIMENTS

1. Write a python program to check if the number is positive or negative or zero and display an appropriate message.
2. Write a python program to take a string from user and count number of vowels present and percentage of vowels in it.
3. Write a python program to find the most frequent words in a text file.
4. Write a Python Program to Find the Sum of first n Natural Numbers.
5. Write a python program to find the numbers which are divisible by 7 and multiple of 5 between 1500 and 2700.
6. Write a Python Program to solve Quadratic Equation.
7. Create a program that ask the user for a number and then prints out a list of all the divisors of that number.
8. Write a Python Program to Find HCF or GCD.
9. Write a Python Program to Find LCM.
10. Write a Python program to construct the following pattern, using a nested loop number.

    1
    22
    333
    4444
    55555
    666666

11. Write a Python Program to sort the given words in Alphabetic Order.
12. Write a Python function to create the HTML string with tags around the word(s).
13. Write a Python program to reverse words in a string.
14. Write a Python program to strip a set of characters from a string.
15. Write a python function to find the maximum and minimum of a list of numbers.
16. Write a Python Program to Find the Square Root.
17. Write a Python Program to Convert Decimal to Binary Using Recursion.
18. Write a python recursive function to a find the factorial of a given number.
19. Write a python program to find the longest word in each line of given file.
20. Write a Python program to combine each line from first file with the corresponding line in second file.
21. Write a Python program to read a random line from a file.
23. Write a Python program to split a list every Nth element.

    Sample list: ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n']
    Expected Output: [['a', 'd', 'g', 'j', 'm'], ['b', 'e', 'h', 'k', 'n'], ['c', 'f', 'i', 'l']]

24. Write a Python program to compute the similarity between two lists.

    Sample data: ["red", "orange", "green", "blue", "white"], ["black", "yellow", "green", "blue"]
    Expected Output:
    Color1-Color2: ['white', 'orange', 'red']
    Color2-Color1: ['black', 'yellow']

25. Write a Python program to replace the last element in a list with another list.

    Sample data: [1, 3, 5, 7, 9, 10], [2, 4, 6,8]
    Expected Output: [1, 3, 5, 7, 9, 2, 4, 6, 8]

26. Write a Python program to find the repeated items of a tuple.
27. Write a Python program to convert a list with duplicates to a tuple without duplicates.
28. Write a Python program to reverse the elements of a tuple.
29. Write a Python program to replace last value of tuples in a list.

    Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]
    Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]

31. Write a Python program to combine two dictionaries by adding values for common keys.

d1 = {'a': 100, 'b': 200, 'c':300}
d2 = {'a': 300, 'b': 200, 'd':400}
Sample output: Counter({'a': 400, 'b': 400, 'd': 400, 'c': 300})

33. Write a Python program to create and display all combinations of letters, selecting each letter from a different key in a dictionary.

Sample data : {'1':['a','b'], '2':['c','d']}
Expected Output:
ac
ad
bc
bd

34. Write a Python program to get the top three items in a shop.

Sample data: {'item1': 45.50, 'item2':35, 'item3': 41.30, 'item4':55, 'item5': 24}
Expected Output:
item4 55
item1 45.5
item3 41.3

35. Write a Python program to match both key values in two dictionaries.

Sample dictionary: {'key1': 1, 'key2': 3, 'key3': 2}, {'key1': 1, 'key2': 2}
Expected output: key1: 1 is present in both x and y

36. Write a Python class named Rectangle constructed by a length and width and a method which will compute the area of a rectangle.

37. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.

38. Write a Python program to create a Single Linked List using classes.

39. Write a Python program to create a FIFO queue using classes.

40. Predict the output of following Python programs and write the justification.

```
class X(object):
    def __init__(self,a):
        self.num = a
    def doubleup(self):
        self.num *= 2

class Y(X):
    def __init__(self,a):
        X.__init__(self,
        a)
    def tripleup(self):
        self.num *= 3

obj = Y(4)
print(obj.num)

obj.doubleup()
print(obj.num)

obj.tripleup()
print(obj.num)
```

41. Predict the output of following Python programs and write the justification.

```
# Base or Super class
class Person(object):
```

```
    def __init__(self, name):
        self.name = name

    def getName(self):
        return self.name

    def isEmployee(self):
        return False

# Inherited or Subclass (Note Person in bracket)
class Employee(Person):
    def __init__(self, name, eid):
    ''' In Python 3.0+, "super().__init__(name)" also works'''
        super(Employee, self).__init__(name)
        self.empID = eid

    def isEmployee(self):
        return True

    def getID(self):
        return self.empID

# Driver code
emp = Employee("Geek1", "E101")
print(emp.getName(), emp.isEmployee(), emp.getID())
```

42. Create a employees database with the following attributes and insert rows. employee_id, first_name, last_name, email, phone_number, hire_date, job_id, salary, commission_pct, manager_id, department_id
43. Write a query to get the highest, lowest, sum, and average salary of all employees.
44. Write a query to get the average salary for all departments employing more than 10 employees.
45. Write a query to find the names (first_name, last_name), the salary of the employees whose salary is greater than the average salary.
46. Write a query to get nth max salaries of employees.

Text Books :	1. A Python Book: Beginning Python, Advanced Python, and Python Exercises, Dave Kuhlman, Open Source MIT License. 2. Python for Data Analysis, Wes McKinney, O' Reilly.
References :	1. Python Data Science Handbook-Essential Tools for Working with 2. Data Science from Scratch, JoelGrus, O'Reilly.

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Data Structures Lab

II B. Tech. –III Semester (Code: 20CBL302)

Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Understand and program basic data structures like arrays and linked lists with their applications.
CO2	Understand and Program data structures like stacks and queues with their applications. Understand and implement sorting algorithms.
CO3	Understand and program on trees, binary trees, binary search trees, avl trees, expression trees and their traversal methods.
CO4	Understand and program on priority queues, hashing and their mechanisms. Basic knowledge of graphs representations and traversing methods.

Course Outcomes: Students will be able to:

CLO-1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.
CLO-2	Understand basic data structures such as arrays, linked lists, stacks and queues.
CLO-3	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.
CLO-4	Solve problem involving trees and heaps
CLO-5	Describe the hash function and concepts of collision and its resolution methods

LIST OF EXPERIMENTS

1. Write a program to perform the following operations on Array List
   a). Creation, b). Insertion, c). Deletion, d). Search, e). Display.
2. Write a program that reads two lists of elements, prints them, reverses them, prints the reverse list, sort the lists, print the sorted lists, merges the list, prints merge list using array list.
3. Write a program to perform the following operations on Single Linked List.
   a). Creation, b). Insertion, c). Deletion, d). Search, e). Display.
4. Write a program to perform the following operations on Doubly Linked List.
   a). Creation, b). Insertion, c). Deletion, d). Search, e). Display.
5. Write a program to perform addition and multiplication of two polynomials using single Linked List.
6. Write a program to convert the given infix expression into postfix expression using stack.
7. Write a program to evaluate the postfix expression using stack.
8. Write a program that performs Radix sort on a given set of elements using queue.
9. Write a program to read n numbers in an array. Redisplay the array list with elements being sorted in ascending order using the following techniques
   a). Bubble Sort, b). Selection Sort, c). Insertion Sort, d).Shell Sort.
10. Write a program to perform Binary Search tree operations and traversals.
11. Write a program to implement AVL tree that interactively allows
    a). Insertion, b). Deletion, c). Find_min, d). Find_max.
12. Write a program to read n numbers in an array. Redisplay the arraylist with elements being sorted in ascending order using Heap Sort.

Text Books :	1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education
References :	1. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, "DataStructures Using C", Pearson Education Asia, 2004. 2. Richard F.Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", ThomsonBrooks / COLE, 1998.

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Object Oriented Programming Lab II B.Tech –III Semester (Code: 20CBL303)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Understand advantages of OO programming over procedural oriented programming, learn the basics of variables, operators, control statements, arrays, classes and objects.
CO2	Understand, write and implement the following concepts: Inheritance, Interfaces, Packages, Strings and Collections.
CO3	Understand and write programs on Exception Handling, I/O, and Multithreading.
CO4	Understand and implement applications using Applets, AWT, Swings and Events.

Course Outcomes: Students will be able to:

CLO-1	Apply Object oriented approach to design software and Implement programs using classes and objects
CLO-2	Develop programs using thread concepts and exception handling
CLO-3	Design and implement Applet and event handling mechanisms in application programs.
CLO-4	Design and develop GUI programs.

LIST OF EXPERIMENTS

1. Write a Java program to declare, initialize and accessing the elements of Single dimensional Arrays, Multidimensional Arrays.
2. Write a Java program to demonstrate recursion.
3. Write a Java program to demonstrate static member, static method and static block.
4. Write a Java program to demonstrate method overloading and method overriding using simple inheritance.
5. Write a Java program to demonstrate multiple inheritance using interfaces.
6. Write a Java program to demonstrate packages.
7. Write a Java program to demonstrate String class methods.
8. Write a Java program to create user defined exception class, use couple of built-in Exception classes.
9. Write a Java program to demonstrate inter-thread communication.
10. Write an Applet program to demonstrate passing parameters to Applet, Graphics, Color and Font classes.
11. Write a Java program to demonstrate handling Action events, Item events, Key events, Mouse events, Mouse Motion events.
12. Write a GUI application which uses the following AWT components Label, Text Field, Text Area, Checkbox, Checkbox Group, Button.
13. Write a GUI application using JTable, JTree, JCombo Box.

Text Books :	1. "Java The Complete Reference", 9th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2014.
References :	1. "Big Java ", 4th Edition, Cay Horstman, John Wiley & Sons, 2009. 2. "Java How to Program (Early Objects)", H. M. Dietel and P. J. Dietel, 11th edition Pearson Education, 2018.

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Professional Ethics & Human Values II B. Tech. –III Semester (Code: 20CB306/MC02)					
Lectures	:	2 Hours/Week	Continuous Assessment	:	30
Final Exam	:		Final Exam Marks	:	

Pre-Requisite: None.

Course Objectives:

CO1	Comprehend a specific set of behavior and values any professional must know and must abide by, including confidentiality, honesty and integrity. Understand engineering as social experimentation.
CO2	Know, what are safety and Risk and understand the responsibilities and rights of an engineer such as collegiality, loyalty, bribes/gifts.
CO3	Recognize global issues visualizing globalization, cross-cultural issues, computer ethics and also know about ethical audit
CO4	Discuss case studies on Bhopal gas tragedy, Chernobyl and about codes of Institute of Engineers, ACM

Course Outcomes: Students will be able to:

CLO-1	Know, about human values and virtues, Learn the importance of living peacefully, caring and sharing, empathy and Understand the basics of Engineering ethics Profession and Professionalism, Professional Roles of Engineers. Also able to Debate on Ethical Theories.
CLO-2	Learn Engineering as Social Experimentation Conscientiousness, Propose Engineers as leaders understand Roles of Codes, and Determine what is safety and risk.
CLO-3	Discuss responsibilities and rights of engineers and loyalty, Learn Engineering as Social Experimentation Explain Confidentiality Occupational Crimes, Whistle Blowing. Visualize Globalization Environmental Ethics and engineering ethics, Discuss Ethical Problems in Research, Intellectual Property Rights (IPRs) Know the importance of Ethical Audit and Understand Variety of Interests.
CLO-4	Understand Case studies (Bhopal Gas Tragedy, The Chernobyl Disaster), and Know about Institution of Engineers (India): Sample Codes of Ethics.

UNIT-1	(8 hours)

Human Values: Morals, Values and Ethics, Integrity, Work Ethics, Service and Learning, Civic Virtue, Respect for Others, Living Peacefully, Caring and Sharing, Honesty, Courage, Value Time, Cooperation, Commitment and Empathy, Spirituality, Character.
Engineering Ethics: History of Ethics, Engineering Ethics, Consensus and Controversy, Profession and Professionalism, Professional Roles of Engineers, Self Interest, Customs and Religion, Uses of Ethical Theories, Professional Ethics, Types of Inquiry, Kohlberg's Theory, Gilligan's Argument, Heinz's Dilemma.
Engineering as Social Experimentation: Comparison with Standard Experiments, Knowledge Gained, Conscientiousness, Relevant Information, Learning from the Past, Engineers as Managers, Consultants, and Leaders, Accountability, Roles of Codes, Codes and Experimental Nature of Engineering.

UNIT-2	(8 hours)

Engineers' Responsibility for Safety and Risk: Safety and Risk, Types of Risks, Safety and the Engineer, Designing for Safety, Risk-Benefit Analysis, Accidents.
Responsibilities and Rights: Collegiality, Two Senses of Loyalty, Obligations of Loyalty, Misguided Loyalty, Professionalism and Loyalty, Professional Rights, Professional

Responsibilities, Conflict of Interest, Self-interest, Customs and Religion, Collective Bargaining, Confidentiality, Acceptance of Bribes/Gifts, Occupational Crimes, Whistle Blowing.	
UNIT-3	(8 hours)
Global Issues: Globalization, Cross-cultural Issues, Environmental Ethics, Computer Ethics, Weapons Development, Ethics and Research, Analyzing Ethical Problems in Research, Intellectual Property Rights (IPRs). **Ethical Audit:** Aspects of Project Realization, Ethical Audit Procedure, The Decision Makers, Variety of Interests, Formulation of the Brief, The Audit Statement, The Audit Reviews.	
UNIT-4	(8 hours)
Case Studies: Bhopal Gas Tragedy, The Chernobyl Disaster. **Appendix 1**: Institution of Engineers (India): Sample Codes of Ethics. **Appendix 2**: ACM Code of Ethics and Professional Conduct.	
Text Books :	1. "Professional Ethics & Human Values", M.GovindaRajan, S.Natarajan, V.S.SenthilKumar, PHI Publications 2013.
References :	1. "Ethics in Engineering", Mike W Martin, Ronald Schinzinger, TMH Publications.

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Mathematical Foundations for Cyber Security II B. Tech. –IV Semester (Code: 20CB401/ MA05)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

UNIT-1	(12 Hours)
Basic Concepts In Number Theory and Finite Fields: Divisibility and The Division Algorithm, The Euclidean Algorithm, Modular Arithmetic, Groups, Rings and Fields, Finite Fields of the form GF(p), Polynomial Arithmetic, Finite Fields of the form GF(2^n) (**Sections 1 to 7 of Chapter 3 in Textbook 1**)	

UNIT-2	(12 Hours)
More on Number Theory: Prime Numbers, Fermat's and Euler's Theorem- Fermat's Theorem, Euler's Totient Function, Euler's Theorem, Testing for Primality- Miller-Rabin Algorithm, A Deterministic Primality Algorithm, Distribution of Primes, The Chinese Remainder Theorem, Discrete Logarithms- The Powers of an Integer, Modulo n, Logarithms for Modular Arithmetic, Calculation of Discrete Logarithms. (**Sections 1 to 5 of Chapter 7 in Textbook 1**)	

UNIT-3	(12 Hours)
Coding Theory: Introduction to error correcting codes, Basic definitions, Matrix description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Liner Block Code, Syndrome Decoding, Error Probability after Coding, Perfect Codes, Hamming Codes, Optimal Linear Codes, Maximum Distance Separable codes. (**Sections 3.1 to 3.12 of Chapter 3 in Textbook 2**)	

UNIT-4	(12 Hours)
Cryptography Basics: Traditional Symmetric – Key Ciphers: Introduction, Substitution ciphers, Transposition ciphers. (**Sections: 3.1, 3.2, 3.3 of Text Book 3**)	

Text Books :	1. Cryptography and Network Security, William Stallings, Pearson, 6th Edition, 2014 2. Information Theory Coding And Cryptography, Ranjan Bose, Tata McGraw-Hill, 4th Edition, 2005. 3. Cryptography & Network Security, Behrouz A. Forouzan, Tata McGraw-Hill, 2010.
References :	

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Web Technologies II B. Tech. –IV Semester (Code: 20CB402)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
FinalExam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Know elements and tags of HTML and apply Styles using Cascading Style Sheets.
CO2	Know basics of Java Script, Functions, Events, Objects and Working with browser objects.
CO3	Know basics of XML, DOM and advanced features of XML.
CO4	To convert XML documents into other formats and XSLT.

Course Outcomes: Students will be able to:

CLO-1	Analyze a web page and identify its elements and attributes
CLO-2	Create web pages using XHTML and Cascading Styles sheets.
CLO-3	Build dynamic web pages using JavaScript (client side programming).
CLO-4	Students will be able to write a well formed / valid XML documents
CLO-5	Understand Web server and its working
CLO-6	Design and implement a client server internet application that accommodates specific requirements and constraints.

UNIT-1	(12 hours)

HTML5: Fundamentals of HTML, Working with Text, Organizing Text in HTML, Working with Links and URLs, Creating Tables, Working with Images, Colors, and Canvas, Working with Forms.

UNIT-2	(12 hours)

CSS: Overview of CSS, Backgrounds and Color Gradients in CSS, Fonts and Text Styles, Creating Boxes and Columns Using CSS, Displaying, Positioning, and Floating an Element, List Styles, Table Layouts.

Dynamic HTML: Overview of JavaScript, JavaScript Functions, Events, Image Maps, and Animations.

UNIT-3	(12 hours)

Dynamic HTML (Cont..): JavaScript Objects, Working with Browser Objects, Working with Document Object.

Document Object Model: Understanding DOM Nodes, Understanding DOM Levels, Understanding DOM Interfaces- Node, Document, Element, Attribute.

UNIT-4	(12 hours)

XML: Working with Basics of XML, Implementing Advanced Features of XML, Working with XSLT.

AJAX: Overview of AJAX, Asynchronous Data Transfer with XML Http Request, Implementing AJAX Frameworks, Working with jQuery.

Text Books :	1. Kogent Learning Solutions Inc.,HTML5 BlackBook : Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and Jquery
References :	1. Harvey M.Deitel and Paul J. Deitel,"Internet &World Wide Web How to Program",4/e,Pearson Education. 2. Jason Cranford Teague, "Visual Quick Start Guide CSS DHTML & AJAX",4e, Pearson Education.

	3. Tom Nerino Doli smith,"Java Script & AJAX for the web", Pearson Education 2007. 4. Joshua Elchorn,"Understanding AJAX",Prentice Hall 2006.

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Database Management System II B. Tech. –IV Semester (Code: 20CB403)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Familiarize with fundamental concepts of database and various database architectures and Design relations for Relational databases using conceptual data modeling.
CO2	Implement formal relational operations in relational algebra and SQL.
CO3	Identify the Indexing types and normalization process for relational databases
CO4	Use mechanisms for the development of multi user database applications.

Course Outcomes: Students will be able to:

CLO-1	Ability to apply knowledge of database design methodology which give a good formal foundation in relational data model and Understand and apply the principles of data modeling using ER Model.
CLO-2	Familiar with relational DB theory and will able to write relational algebra expressions, Relational Calculus and SQL.for query
CLO-3	Design database schema and Identify and solve the redundancy problem in database tables using normalization.
CLO-4	Understand transaction processing, concurrency control and recovery techniques.

UNIT-1 (12 hours)

Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach–Actors on the Scene- Workers behind the Scene-Advantages of Using the DBMS Approach.

Database System Concepts and Architecture: Data Models, Schemas, and Instances- Three-Schema Architecture and Data Independence- Database Languages and Interfaces- The Database System Environment -Centralized and Client/Server Architectures for DBMSs.

Data Modeling Using the Entity-Relationship(ER)Model: Using High-Level Conceptual Data Models for Database Design-An Example Database Application-Entity Types, Entity Sets, Attributes, and Keys-Relationship Types, Relationship Sets, Roles, and Structural Constraints-Weak Entity Types-Refining the ER Design for the COMPANY Database-ER Diagrams, Naming Conventions, and Design Issues

UNIT-2 (12 hours)

The Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT -Relational Algebra Operations from Set Theory-Binary Relational Operations: JOIN and DIVISION–Additional Relational Operations-The Tuple Relational Calculus-The Domain Relational Calculus

Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types –Specifying Constraints in SQL-Schema Change Statements in SQL-Basic Queries in SQL – More Complex SQL Queries-INSERT, DELETE, and UPDATE Statements in SQL- Views (VirtualTables) in SQL

UNIT-3 (12 hours)

Disk Storage, Basic File Structures: Introduction - Secondary Storage Devices - Buffering of Blocks - Placing File Records on Disk - Operations on Files - Files of Unordered Records (Heap Files) - Files of Ordered Records (Sorted Files) - Types of Single-Level Ordered Indexes Multilevel Indexes - Dynamic Multilevel Indexes Using B-Trees and B+-Trees - Indexes on

Multiple Keys

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions - Algorithms for Relational Database Schema Design - Multi-valued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form.

UNIT-4	(12 hours)

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing-Transaction and System Concepts-Desirable Properties of Transactions-Characterizing Schedules Based on Recoverability –Characterizing Schedules Based on Serializability

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control –Concurrency Control Based on Time stamp Ordering– Multi version Concurrency Control Techniques- Validation(Optimistic) Concurrency Control Techniques-Granularity of Data Itemsand Multiple Granularity Locking

Database Recovery Techniques: Recovery Concepts-Recovery Techniques Based on Deferred Update - Recovery Techniques Based on Immediate Update-Shadow Paging

Text Books :	1. Fundamentals of Database Systems, Ramez Elmasri and Navathe Pearson Education, 6thedition
References :	1. Introduction to Database Systems, C.J. Date Pearson Education 2. Database Management Systems, Raghu Rama krishnan, Johannes Gehrke, TATA McGraw Hill3rdEdition 3. Database System Concepts, Silberschatz, Korth, McGraw hill,5thedition

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Design And Analysis of Algorithms II B. Tech. –IV Semester (Code: 20CB404)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: Data Structures

Course Objectives:

CO1	Understand about designing and effectiveness of an algorithm, and applying of Master Theorem to find the complexity.
CO2	Strengthen divide and conquer paradigms and know the optimal solution finding with the greedy method.
CO3	Acquaintance of algorithm design strategies of Dynamic programming and easy know the major graph algorithms and their analyses.
CO4	Get the ability to backtracking, branch with bound values and NP problems.

Course Outcomes: Students will be able to:

CLO-1	Analyze the performance of algorithms through various strategies and apply the Master theorem to estimate the complexity of divide-and-conquer algorithms.
CLO-2	Apply the divide-and-conquer and greedy techniques to solve problems and perform complexity analysis.
CLO-3	Articulate on graph problems and identify the applicability of the dynamic-programming paradigm for designing solutions to problems.
CLO-4	Find all possible solutions for combinatorial and optimixation problems using Backtracking and Branch and Bound algorithms and also categorize the P and NP complex problems.

UNIT-1 (12 hours)

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation-Bigoh-notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.

Master Theorem: Introduction, Generic Form- Case1, Case2, Case3, Inadmissible equations, Application to common algorithms.

UNIT-2 (12 hours)

Divide and conquer: General method, applications-Quicksort, Merge sort, Stassen's matrix multiplication.

Greedy method: General method, applications-Job sequencing with deadlines, Fractional knapsack problem, Minimum cost spanning trees-Prims, Kruskal, Single source shortest path problem- Dijkstra.

UNIT-3 (12 hours)

Dynamic Programming: General method, applications-0/1 knapsack problem, Travelling salesperson problem, Longest common sequence algorithm, Multi stage graphs using Forward& Backward approach, Reliability design.

Graph Applications: Graph traversals – Depth first, Breadth first, Bio Connected Components, Strongly Connected Components.

UNIT-4 (12 hours)

Backtracking: General method, applications-n-queen problem, sum of subsets problem. Branch and Bound: General method, applications- 0/1 knapsack problem-LC Branch and

Bound solution. **NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP-Hardand NP Complete classes, Cook's theorem.	
Text Books :	1. E. Horowitz, S.SahniandS. Rajasekaran,"Fundamentalsof Computer Algorithms",GalgotiaPublication.
References :	1. T. H. Cormen, Leiserson,RivestandStein,"Introduction of ComputerAlgorithm",PHI. 2. SaraBasse,A.V.Gelder,"ComputerAlgorithms",AddisonWesley.

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Technical English II B.Tech –IV Semester (Code: 20CB405/EL02)					
Lectures	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	At enhancing the vocabulary competency of the students
CO2	To enhance the understanding of the elements of grammar
CO3	To enable the students to use proper spelling, grammar in constructing the sentences
CO4	To enhance the learner's ability to communicate accurately

Course Outcomes: Students will be able to:

CLO-1	To comprehend the importance, barriers and strategies of listening skills in English.
CLO-2	To illustrate and impart practice Phonemic symbols, stress and intonation.
CLO-3	To practice oral skills and receive feedback on learners' performance.
CLO-4	To practice language in various contexts through pair work, role plays, group work and dialogue conversations

UNIT-1	(12 hours)
1.1 Vocabulary Development: Familiarizing Idioms &Phrases 1.2 Grammar for Academic Writing: Making Requests 1.3 Language Development: Using Transition & Link words 1.4 Technical Writing: Letter Writing &Email Writing	

UNIT-2	(12 hours)
2.1 Vocabulary Development: Analogous words, Gender Sensitive language 2.2 Grammar for Academic Writing: Tenses: Simple Past /Present Perfect, The Future: Predicting &Proposing 2.3 Language Development: Cloze tests 2.4 Technical Writing: Technical Reports	

UNIT-3	(12 hours)
3.1 Vocabulary Development: Abbreviations &Acronyms 3.2 Grammar for Academic Writing: Describing(People/Things/Circumstances) : Adjectival &Adverbial groups 3.3 Language Development: Transcoding (Channel conversion from chart to text) 3.4 Technical Writing: Circular, Memos, Minutes of Meeting	

UNIT-4	(12 hours)
4.1 Vocabulary Development: Corporate vocabulary 4.2 Grammar for Academic Writing: Inversions &Emphasis 4.3 Language Development: Reading Comprehension 4.4 Technical Writing: Resume Preparation	

References :

1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford UniversityPress:2011.
2. Technical Communication Principles and Practice. Oxford UniversityPress:2014.

	3. Advanced Language Practice, Michael Vince. Macmillan Publishers:2003. 4. Objective English (Third Edition), Edgar Thorpe & Showick. Pearson Education:2009 5. English Grammar: A University Course (Second Edition), Angela Downing Philip Locke, Routledge Taylor & Francis Group 2016

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Kali Linux Virtual Lab Setup II B. Tech. –IV Semester (Code: 20CBL401/SO01)					
Practicals	:	5 Hours/Week (2T+3P)	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: Operating Systems (20CB304).

Course Objectives: Students will be able to:

CO1	Know the installation of VM-ware & Kali Linux & Windows OS.
CO2	Execute different Kali Linux commands.
CO3	Learn about Package-management system, Networks, and IPv4 - Address Classes.
CO4	Know the malwares, hackers, and DVWA installation & Configurations.

Course Outcomes:

CLO-1	Understand the installation of VM-ware, Kali Linux & Windows OS.
CLO-2	Execution of different Kali Linux commands.
CLO-3	Study about Package-management system, Networks, MAC and IPv4 - Address Classes.
CLO-4	Understand the malwares, hackers, and DVWA installation & Configurations.

UNIT-1	(8 Hours)

Installing & Basic Over View: Introduction to VM-ware & Kali Linux, Kali Distribution, System Requirements, Different ways of installing Kali Linux, Installing VM-ware, Installing VM ware Tools, Installing Kali Linux, installing Metasploit able 2, Installing Windows OS.

LIST OF EXPERIMENTS

1. Installation of VM-ware in windows operating systems.
2. Installation of kali linux in VM-ware.
3. Installation of windows OS in VM-ware.
4. Installation of metaspotiable-2 in VM-ware.

UNIT-2	(8 Hours)

Kali Linux commands: - uname**,** pwd, ls**,** history**,** ifconfig**,** echo, cat, Clear, mkdir, rmdir cd, cp, mv, rm, more, less, sort**,** vi, nano, leafpad, chmod,Whoami, Who, Uptime, cal, date, ps, kill.

LIST OF EXPERIMENTS

1. Execution of Kali Linux commands.

UNIT-3	(12 Hours)

Package-management system: - package, Updating & upgrading of packages, Differentiate update & upgrade. Install, remove and purge a new package.

Network Introducion: - Computer, Network, LAN, MAN and WAN, Topologies, client-server & peer to peer architecture architecture, Transmission medium**.**

MAC & IP ADDRESSS-IPV4:-

LIST OF EXPERIMENTS

1. Updating & upgrading of available packages in the systems
2. Install, remove and purge a new package in a System.

UNIT-4	(12 Hours)

Basic Terminology:- Cyber Security, Virus & it's types, Anti-virus, Worms, Trojan horses, White hat hackers, Black hat hackers.

DVWA: - Introduction, Installation & Configuration.

LIST OF EXPERIMENTS

1. Installing & Configuration of DVWA web application.

References :	**1.** Basic Security Testing with Kali Linux -Daniel W. Dieterle **2.** Hacking exposed web applications - JOEL SCAMBRAY MIKE SHEMA. **3.** Cryptography and network security –Behrouz A. Forouzan.

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Web Technologies Lab II B.Tech–IV Semester (Code: 20CBL402)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	50
Final Exam	:	3 hours	Final Exam Marks	:	50

Pre-Requisite: None.

Course Objectives:

CO1	Know elements and tags of HTML and apply Styles using Cascading Style Sheets.
CO2	Know basics of Java Script, Functions, Events, Objects and Working with browser objects.
CO3	Know basics of XML, DOM and advanced features of XML.
CO4	To convert XML documents into other formats and XSLT.

Course Outcomes: Students will be able to:

CLO-1	Analyze a web page and identify its elements and attributes
CLO-2	Create web pages using XHTML and Cascading Styles sheets.
CLO-3	Build dynamic web pages using JavaScript (client side programming).
CLO-4	Students will be able to write a well formed / valid XML documents
CLO-5	Understand Web server and its working
CLO-6	Design and implement a client-server internet application that accommodates specific requirements and constraints.

LIST OF EXPERIMENTS

1. Write HTML5 document to design a webpage. (Using all fundamental elements, Organizing text, Links, URLs and Tables).
2. Write HTML5 document to design a webpage. (Using Images, Colors, Canvas & Forms).
3. Write codes for different types of styles in CSS3.
4. Write java scripts covering Function, Arrays and Events.
5. Demonstrate JavaScript objects.
6. Demonstrate browser objects.
7. Demonstrate Document Object Model for an HTML document.
8. Write well-formed and valid XML documents.
9. Write code for converting XML document to HTML using XSLT.
10. Build a webpage using JQuery and its components.

Text Books :	1. Kogent Learning Solutions Inc.,HTML5 Black Book:CoversCSS3,Javascript,XML,XHTML,Ajax,PHPandJquery.
References :	1. Harvey M. DeitelandPaulJ.Deitel,"Internet &World Wide Web How toProgram",4/e, Pearson Education. 2. Joshua Elchorn,"Understanding AJAX", Prentice Hall 2006.

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RDBMS Lab II B.Tech–IV Semester(Code: 20CBL403)					
Practicals	:	3 Hours/Week	Continuous Assessment	:	30
Final Exam	:	3 hours	Final Exam Marks	:	70

Pre-Requisite: None.

Course Objectives:

CO1	Familiarize with fundamental concepts of database and various database architectures and Design relations for Relational databases using conceptual data modeling.
CO2	Implement formal relational operations in relational algebra and SQL.
CO3	Identify the Indexing types and normalization process for relational databases
CO4	Use mechanisms for the development of multi user database applications.

Course Outcomes: Students will be able to:

CLO-1	Ability to apply knowledge of database design methodology which give a good formal foundation in relational data model and Understand and apply the principles of data modeling using ER Model.
CLO-2	Familiar with relational DB theory and will able to write relational algebra expressions, Relational Calculus and SQL.for query
CLO-3	Design database schema and Identify and solve the redundancy problem in database tables using normalization.
CLO-4	Understand transaction processing, concurrency control and recovery techniques.

LIST OF EXPERIMENTS

Experiment 1: Working with ER Diagram and Normalization

Example: ER Diagram for Sailors Database

Entities:

1. Sailor
2. Boat

Relationship:

Reserves

Primary Key

Atributes:

1. SID (Sailor Entity)
2. BID (Boat Entity)

Experiment 2: Working with DDL, DML, DCL and Key Constraints

Creation, Altering and Dropping of Tables and Inserting Rows into a Table (Use Constraints While Creating Tables) Examples Using Select Command.

Experiment 3: Working with Queries and Nested QUERIES

Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints

Expriment 4: Working with Queries USING Aggregate Operators & views

Queries using Aggregate Functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and Dropping of Views

Experiment 5: Working with Conversion Functions & String Functions

Queries using Conversion Functions (TO_CHAR, TO_NUMBER AND TO_DATE), String Functions (CONCATENATION, LPAD, RPAD, LTRIM, RTRIM, LOWER, UPPER,

INITCAP, LENGTH, SUBSTR AND INSTR), Date Functions (SYSDATE, NEXT_DAY, ADD_MONTHS, LAST_DAY, MONTHS_BETWEEN), LEAST, GREATEST, TRUNC, ROUND, TO_CHAR, TO_DATE

Experiment 6: Working with Triggers using PL/SQL

Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

Experiment 7: Working with PL/SQL Procedures

Programs Development using Creation of Procedures, Passing Parameters IN and OUT of PROCEDURES

Experiment 8: Working with LOOPS using PL/SQL and Exception Handling

Program Development using WHILE LOOPS, Numeric FOR LOOPS, Nested Loops using ERROR Handling, BUILT-IN Exceptions, USE Defined Exceptions, RAISE-APPLICATION ERROR

Experiment 9: Working with Functions Using PL/SQL

Program Development using Creation of Stored Functions, Invoke Functions in SQL Statements and Write Complex Functions.

Experiment 10: Working CURSORS

Develop Programs using Features Parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of Clause and CURSOR Variables

Experiment11: Installation of SQL

Text Books :	Oracle PL/SQL by Example, Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rdEd 2. Oracle Database Logic PL/SQL Programming, ScottUrman, TataMc-Graw Hill. 3. SQL and PL/SQL for Oracle 10g, Black Book, Dr.P.S.Deshpande
References :	